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Four Moments of Antimicrobial Stewardship:

Meeting The Challenge

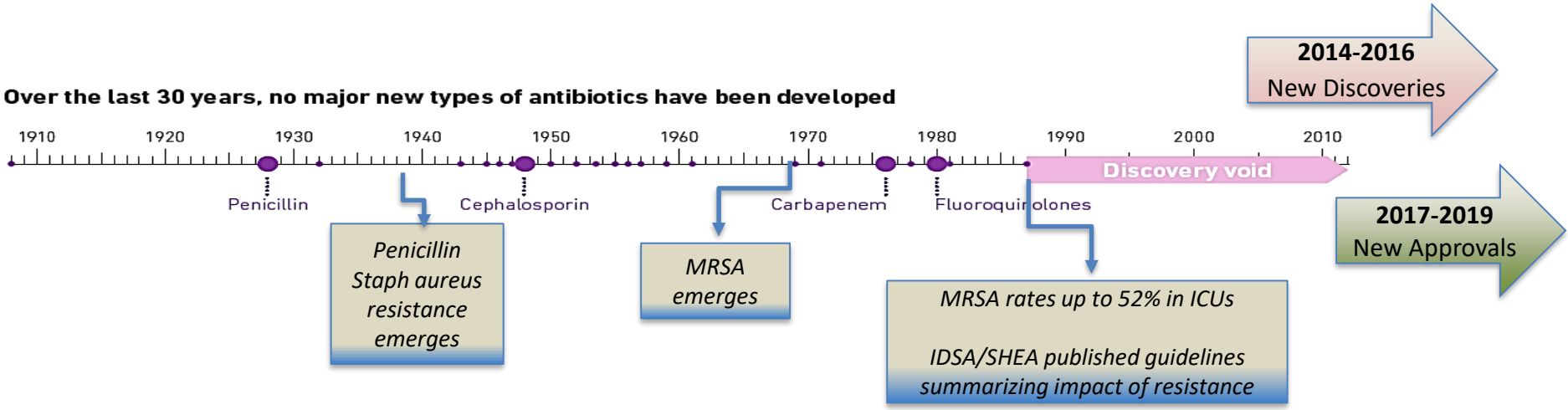
Lama Hsaiky, PharmD, BCPS

Antimicrobial Stewardship Pharmacy Lead- Beaumont Health

Antimicrobial Stewardship Committee Member-MSHP

June 20, 2019

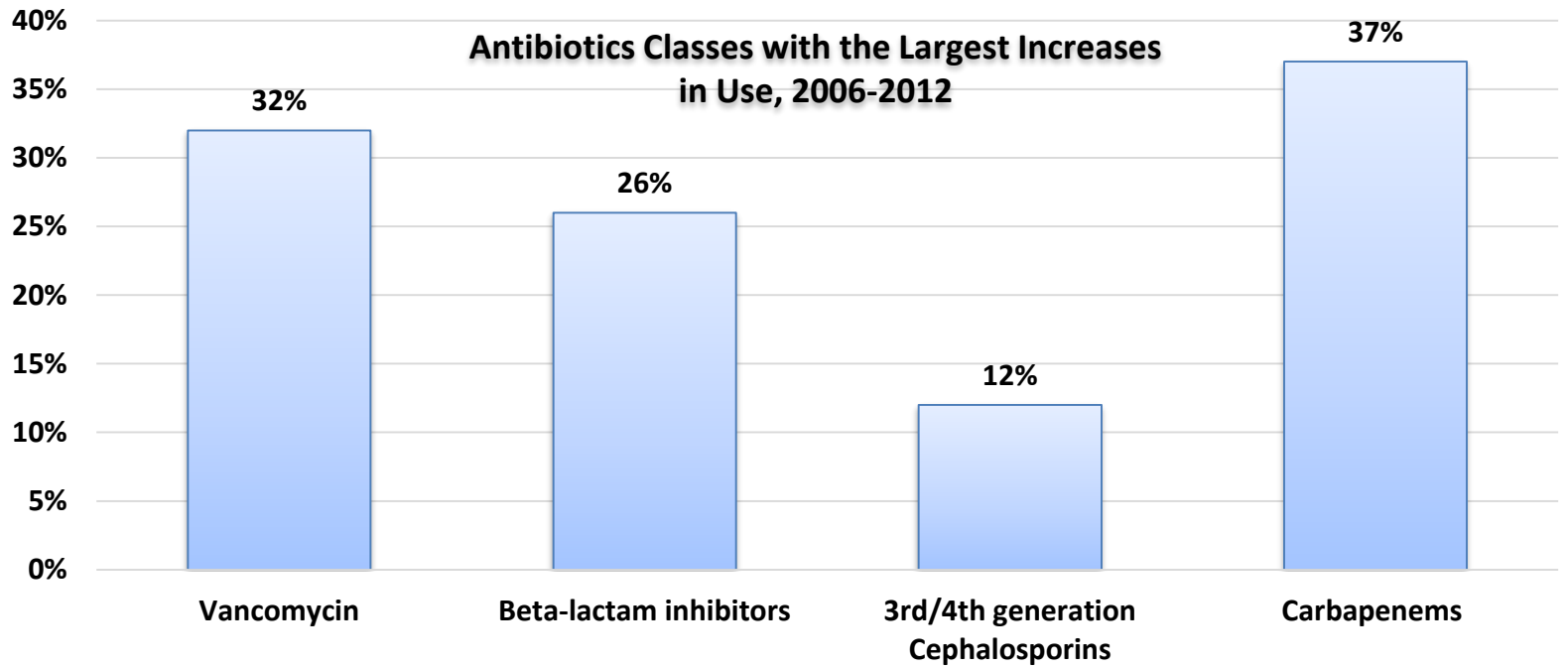
What Do We Know About Antibiotic Use?



- One-third of antibiotic prescriptions in hospitals involve potential prescribing problems such as giving an antibiotic without proper testing or evaluation
- Two out of three antibiotics in hospitals are given for three conditions: pneumonia, urinary tract infections (including bladder and kidney infections), and skin infections
- Antibiotic-resistant bacteria annually cause at least 2 million illnesses and 23,000 deaths in the United States
- C. *difficile* causes diarrhea linked to at least 14,000 American deaths each year
- Every year, there are more than 140,000 emergency department visits for reactions to antibiotics

https://www.cdc.gov/drugresistance/pdf/5-2013-508.pdf
JAMA Internal Medicine **2016**; 176(11):1639-48;
MMWR Morbidity and Mortality Weekly Report **2014**; 63(9): 194-200. https://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf

What Do We Know About Antibiotic Use?



- In a 2016 study, CDC experts found that overall rates of antibiotic use in U.S. hospitals did not change from 2006-2012
- More than half of patients received at least one antibiotic during their hospital stay
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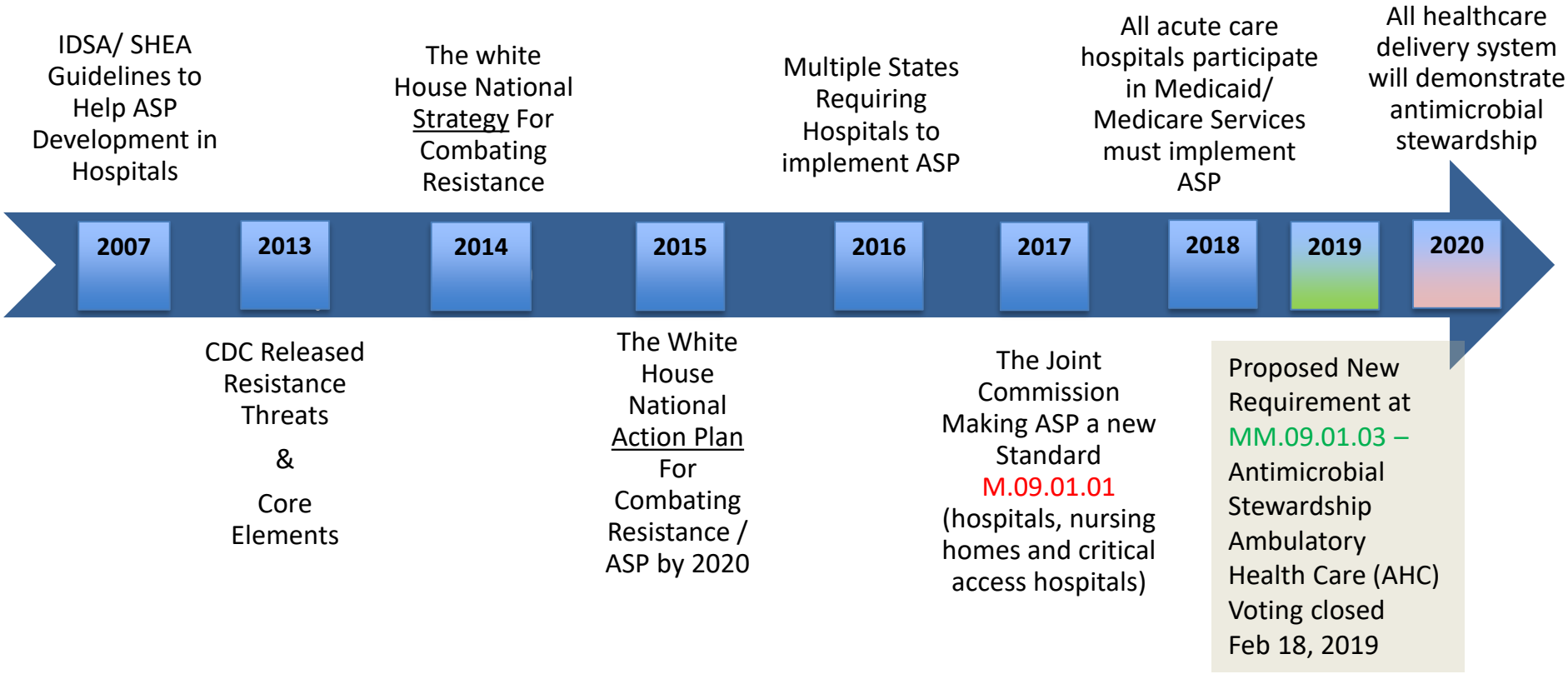
Why Antimicrobial Stewardship?



www.whitehouse.gov/the-pressoffice/ 2014/09/18/executive-order-combating-antibiotic-resistant bacteria. http://federalregister.gov/a/2016-13925. Published June 16, 2016.
www.jointcommission.org/ prepublication_standards_antimicrobial_stewardship_standard/. Published June 22, 2016.
www.cdc.gov/getsmart/healthcare/implementation/coreelements. www.whitehouse.gov/sites/default/files/ docs/national_action_plan_for_combating_antibotic-resistant_bacteria.pdf. Published March 2015

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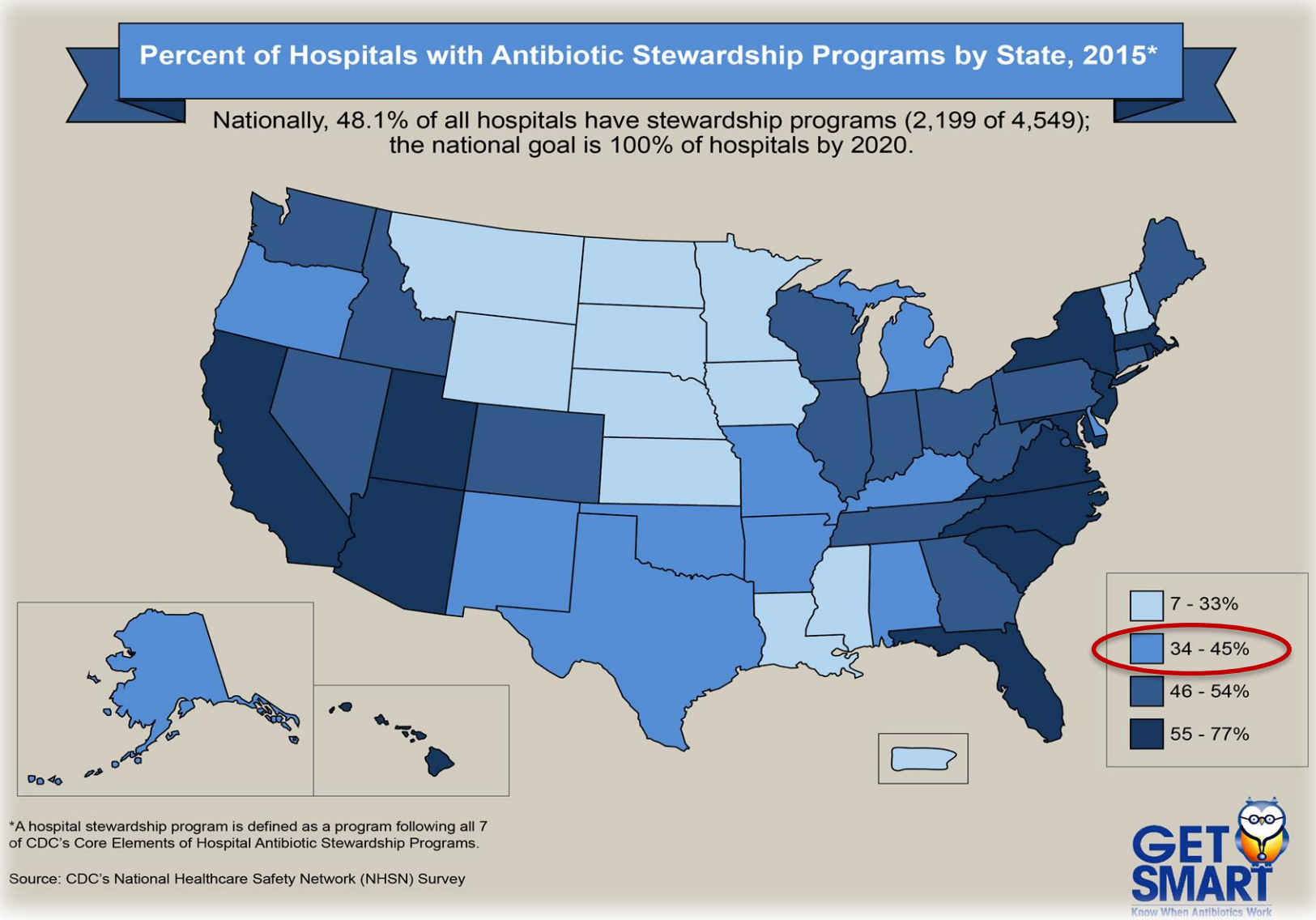
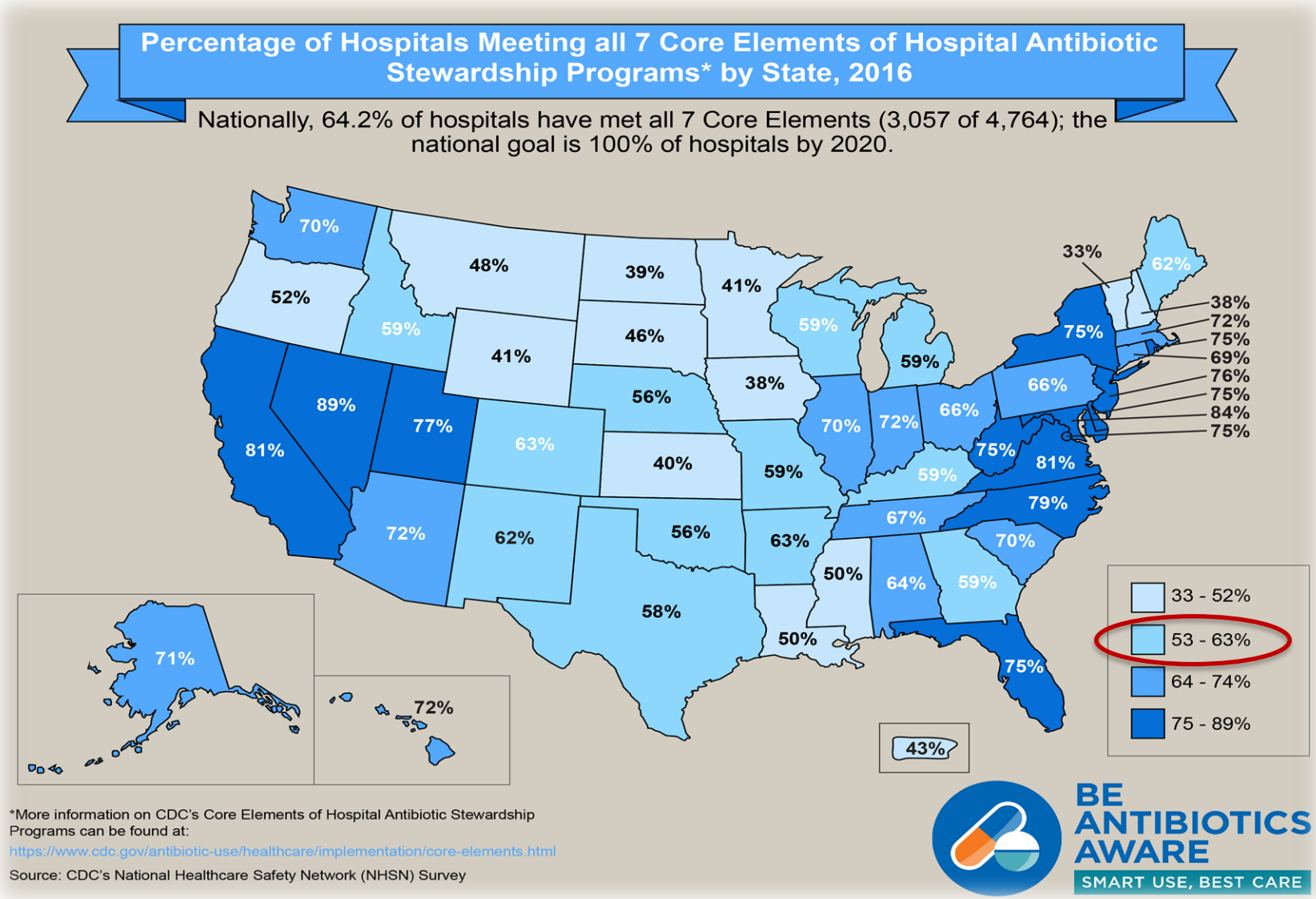


https://www.cdc.gov/antibiotic-use/community/images/materials/2015-Percentages-rev2-01.jpg



https://www.cdc.gov/antibiotic-use/community/images/materials/2016-Percentages-B.jpg

What are the Stewardship Core Elements?

Core elements	JC	CDC	CMS
LEADERSHIP SUPPORT: Statement of support from leadership & Financial support for antibiotic stewardship activities	✔	✔	✔
ACCOUNTABILITY: Physician leader & Pharmacist leader	✔	✔	✔
TEAM: Key Personnel involved in the program	✔	✔	✔
ANTIBIOTIC STEWARDSHIP POLICIES: Antibiotic prescriptions with dose, duration, and indication ; Facility-specific treatment recommendations	✔	✔	✔
INTERVENTIONS TO IMPROVE ANTIBIOTIC USE: Assess appropriateness of all antibiotics 48 hours after the initial orders ; Formulary restriction; Prospective audit with feedback; Parenteral to oral conversion; Dose adjustments in cases of organ dysfunction; Dose optimization; Identify unnecessarily duplicative therapy; Identify bug/drug mismatches; Automatic stop orders for specified antibiotic prescriptions or (48 hrs. time out per JC and CMS)	✔	✔	✔
DIAGNOSIS AND INFECTIONS SPECIFIC INTERVENTIONS: Specific interventions in place to ensure optimal use of antibiotics to common infections; Guidelines for antimicrobial use in pediatrics (if applicable)	✔	✔	✔
MONITORING ANTIBIOTIC PRESCRIBING, USE, AND RESISTANCE: Monitor adherence to a documentation policy ; Monitor adherence to facility-specific treatment recommendations; Monitor compliance with one or more of the specific interventions in place	✔	✔	✔

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www.jointcommission.org/ prepublication_standards_antimicrobial_stewardship_standard/. Published June 22, 2016. www.cdc.gov/getsmart/healthcare/implementation/coreelements;

What are the Stewardship Core Elements?

Core elements	JC	CDC	CMS
ANTIBIOTIC USE AND OUTCOME MEASURES: Track rates of C.*difficile* infection; Monitor antibiotic use ; Monitor antibiotic cost	✔	✔	
REPORTING INFORMATION TO STAFF ON IMPROVING ANTIBIOTIC USE AND RESISTANCE: Share facility-specific reports on antibiotic use with prescribers; Antibiogram developed for facility; Prescribers receive direct, personalized communication about how they can improve their antibiotic prescribing	✔	✔	
ACTION STEPS: Take action on improvement opportunities identified in antimicrobial stewardship program	✔	✔	✔
EDUCATION: Education to clinicians and other relevant staff on improving antibiotic prescribing	✔	✔	✔
PATIENT AND FAMILY EDUCATION: regarding the appropriate use of antimicrobial medications		✔	
TRANSITION OF CARE: process to prevent transmission of diseases, follow-up on cultures and indication for antibiotic use and optimization of treatment			✔
INFORMATION TECHNOLOGY: dedicated staff			✔

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Stewardship in Long Term Facilities

- Joint commission required
- CDC core element similar to acute care with more remote feasibility
- CMS:
  - Initial Proposal 2015
  - October 2016, final rule in place
  - By November 2019, the CMS will require all long-term care providers to have a person solely dedicated to the prevention and control of infections among patients

- Challenges in Long term facilities:
  - Physicians usually only visit a few times a week to check in on their patients
  - Pharmacists and lab testing is also resourced out

- CMS acknowledged these challenges in its October 2016 final rule and said it would allow facilities the "flexibility" to decide which national standards they wanted to follow

- CMS cited guidelines created by the CDC, the Society for Healthcare Epidemiology of America and others as sufficient for nursing homes to abide by the rule

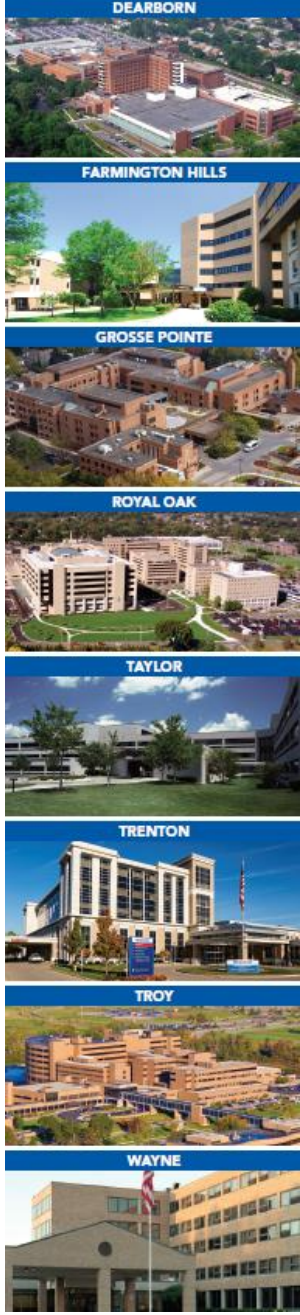
https://www.cdc.gov/longtermcare/pdfs/core-elements-antibiotic-stewardship-checklist.pdf

How to be Prepared?

- Begin to review available resources
- Gap analysis
- Capabilities
  - Technology
  - Documentation
  - Staff and available resources

Beaumont Health

- Located in Southeast Michigan
- Formed in 2014 from three founding organizations: Beaumont Health System, Botsford Hospital and Oakwood Health System
- Comprised of:
  - 8 hospitals
  - 3,429 beds
  - 187 health centers
  - 5,000 physicians
  - 38,000 employees



Stewardship Structure Pre-Merge

Beaumont Health

Corporate Antimicrobial Subcommittee **(CASC)**

3 hospitals

Oakwood Health

Infectious Diseases Antimicrobial Subcommittee **(IDeAS)**

4 hospitals

Botsford Hospital

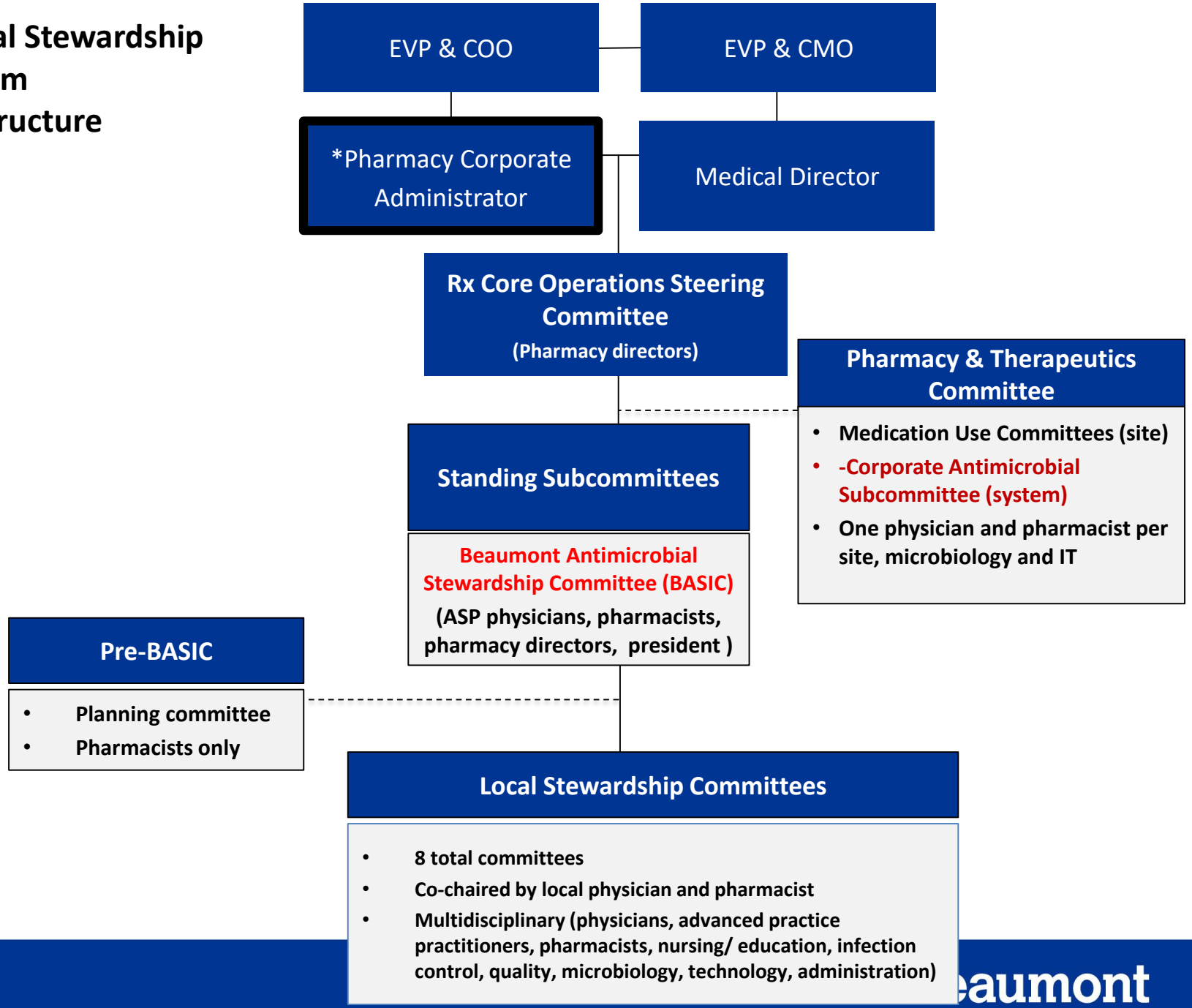
Farmington Hills Antimicrobial Subcommittee

1 hospital

Organizational Priority and Stewardship Mission

- Accountability documents
  - Antimicrobial stewardship program corporate policy
    - ASPs are established in all 8 hospitals with standardized objectives and reporting
    - Improve patient clinical outcomes
    - Reduce cost
    - Minimize adverse events
    - Decrease antimicrobial resistance
    - Decrease rates of hospital-acquired infections
    - Achieve Stewardship Metrics
- Budget plans
  - Budget allocation for 10 antimicrobial stewardship pharmacists (5.75 FTE) and 8 physicians (1.5 FTEs) for ASP to meet the CMS recommendation
  - IT full support not sufficient
- Infection Prevention plans
  - Infection Prevention Quality Standards
    - C. *difficile* reduction
    - Multi-drug resistance reduction
    - Surgical site infection reduction
- Strategic planning occurs at the health system and local level based on organization and site needs

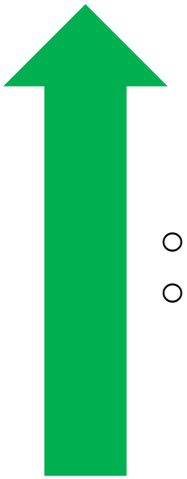
Antimicrobial Stewardship Health System Oversight Structure



What is the role of ASP?

Decrease

- ANTIBIOTIC RESISTANCE
- *C. DIFFICILE* INFECTIONS
- TREATMENT FAILURES
- ADVERSE EVENTS
- COSTS



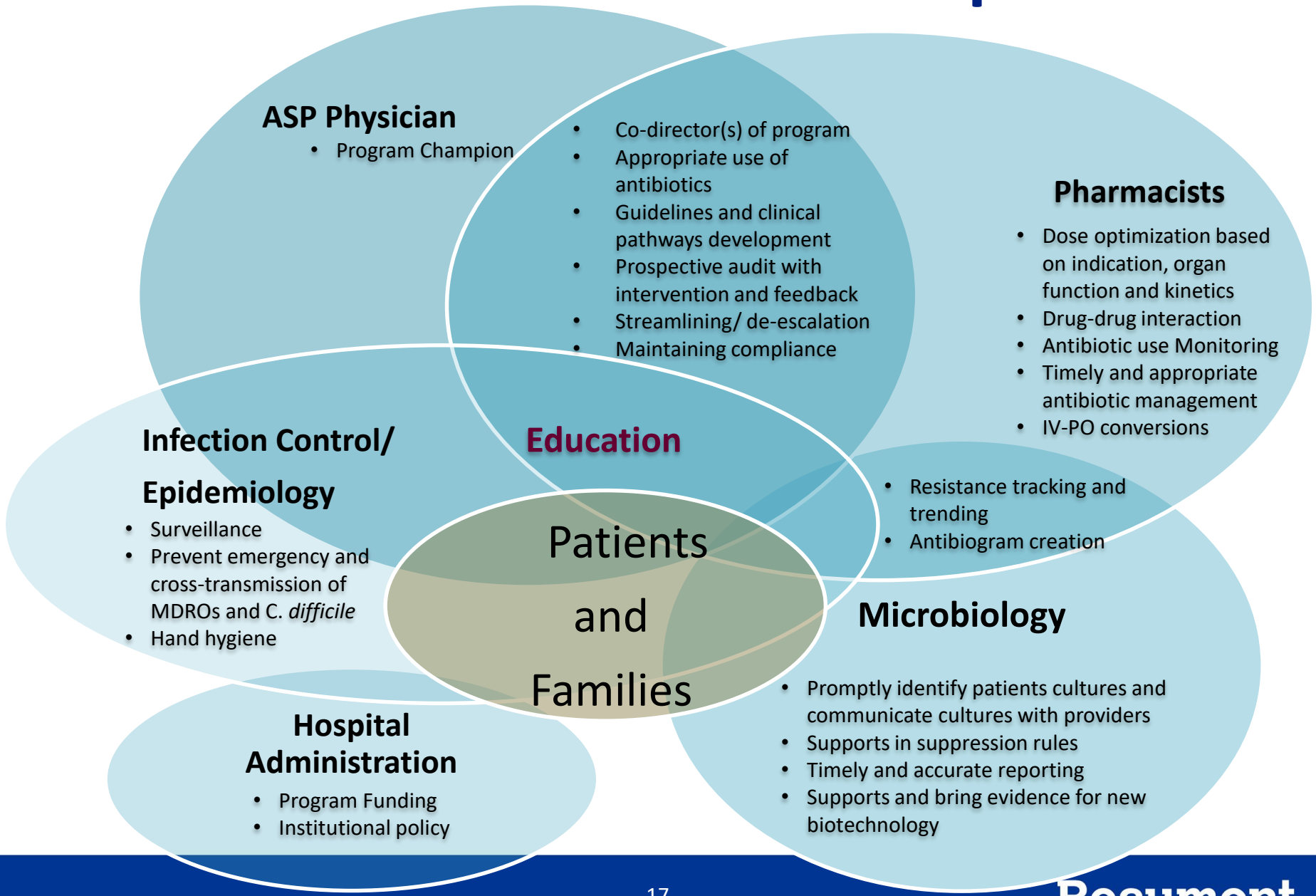
Increase

- GOOD PATIENT OUTCOMES
- CORRECT PRESCRIBING PRACTICES

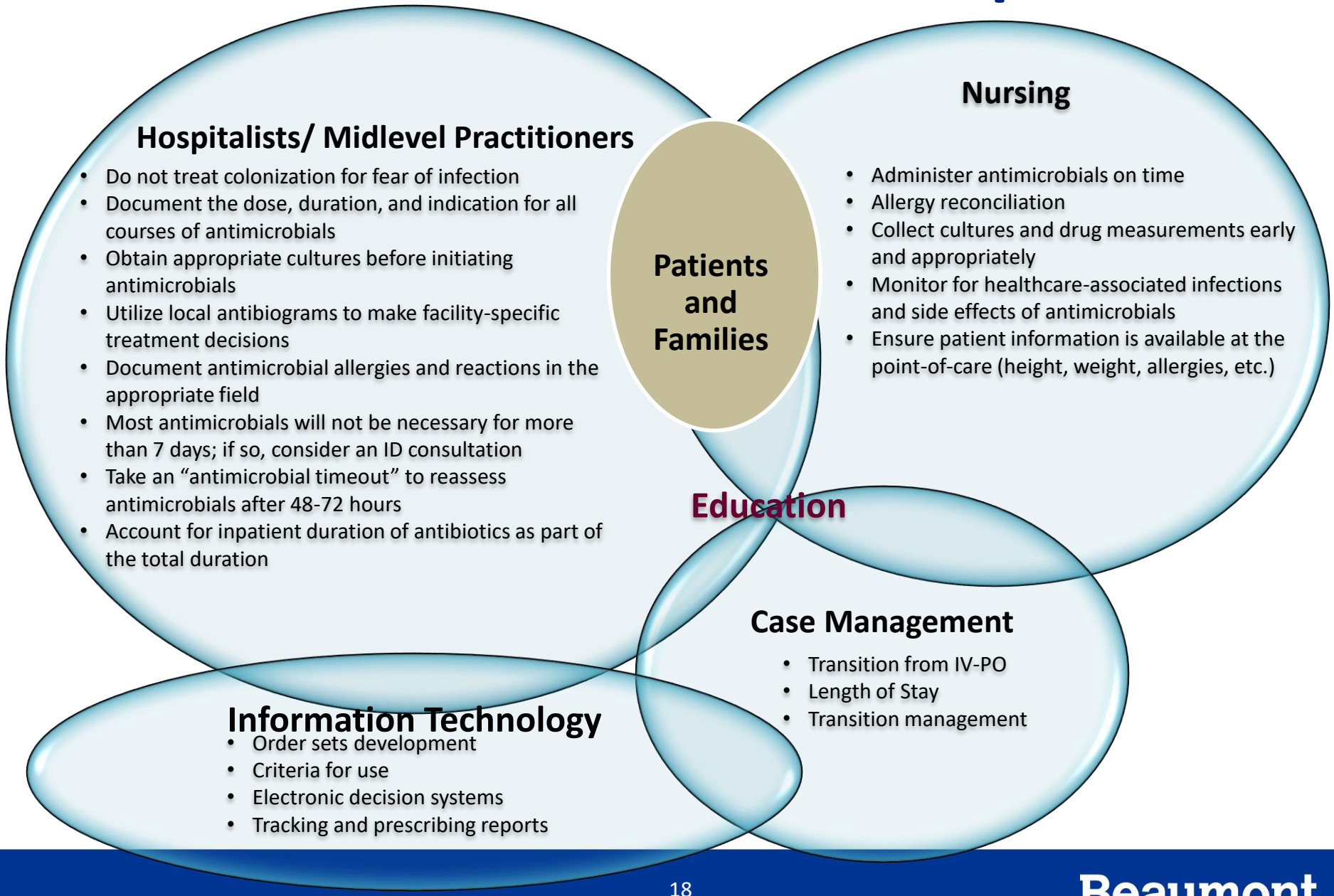
Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), the Pediatric Infectious Diseases Society (PIDS)

Who is involved in ASP?

Essential Roles of Stewardship Team



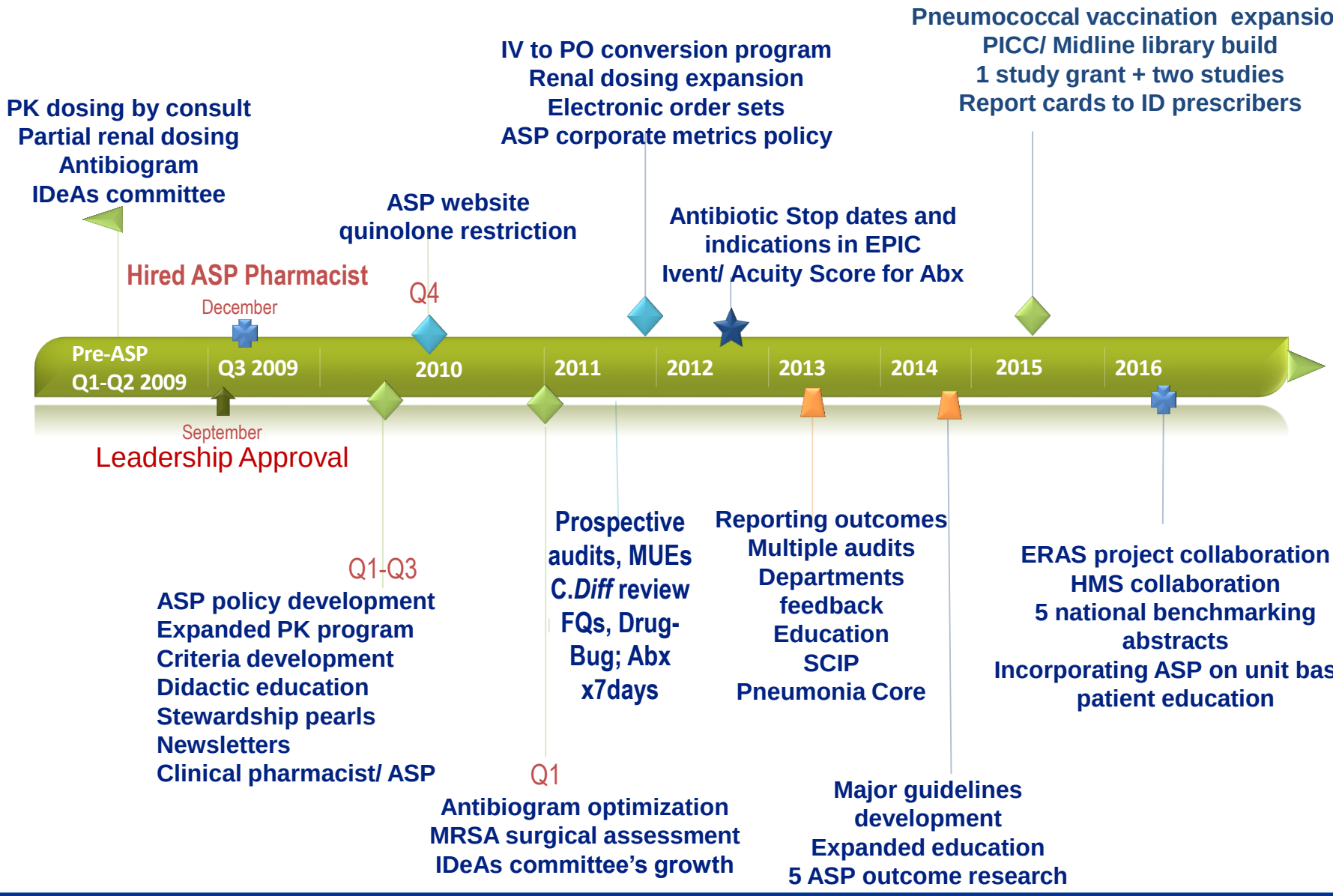
Essential Roles of Stewardship Team



Compliance with Core Elements

- **Leadership commitment**
  - Local support from Chief of Staff and Chief Medical Officer
  - Health system support from Chief Pharmacist and Chief Operating Officer
- **Accountability**
  - 8 local Medical Directors
  - 1 corporate Medical Lead of Antimicrobial Stewardship Program
- **Drug expertise**
  - 10 local PharmDs, Clinical Pharmacy Specialists in Infectious Diseases and one PGY2 ID resident
  - 1 corporate Pharmacy Lead of Antimicrobial Stewardship Program
- **Action**
- **Tracking**
- **Reporting**
- **Education**

Actions on ASP Pre-merge



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Actions on ASP Post-merge

Merge Occurred

Antimicrobial Stewardship Strategic Plan

SSTI, UTI, CAP, IAI, COPD, febrile neutropenia, MRSA , VRE and candidiasis corporate guidelines/ Order sets
Antibiotic cascading
MRSA PCR testing-pharmacy
Clinical mandatory module
IV to PO corporate policy
Automatic de-escalating ceftriaxone to oral cephalexin's in CAP
Pneumococcal vaccination automated process

Assessment of antimicrobial stewardship(AMS) corporate resources

Corporate leadership approval

Corporate antimicrobial subcommittee

Corporate policy and metrics

Standardizing antibiotic formulary for BH
Automatic stop orders 5 days
Mandatory education to staff
Occupational PEP-HIV
Flu vaccine standing order
HMS Collaboration
Fluoroquinolone selective suppression
Antibiotic surgical prophylaxis
Penicillin skin testing protocol
Reflex urine culture for non-catheterized specimens
Respiratory cultures -PCR
Corporate antibiotic awareness week
AHRQ project participation
EPIC/ ASP ICON gap analysis
MAD-ID certifications
25 local and national ASP abstracts
Sepsis Order set
Return on investment (>$500,000) cost savings

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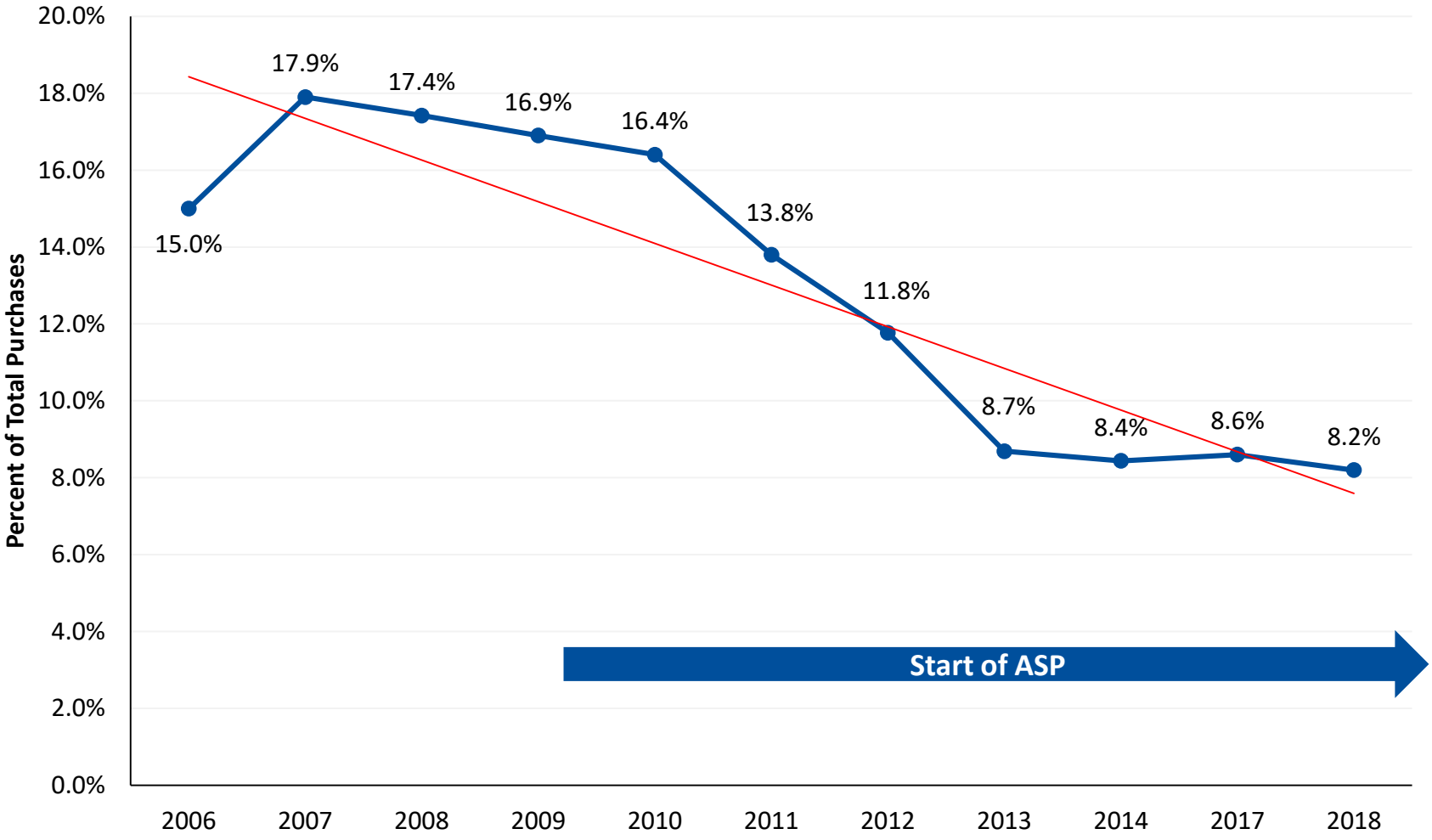
ASP Outcome Measures/ Reporting

Volume	Antimicrobial expenditure as percent of overall budget Days of therapy (DOT) / 1000 patient days
Quality	Measure the appropriateness of antimicrobial use Pharmacist interventions Medication use evaluation (MUE) of targeted antibiotics
Outcome	Measure impact of antimicrobial stewardship Annual antibiograms Hospital-acquired *C. difficile* infection rates

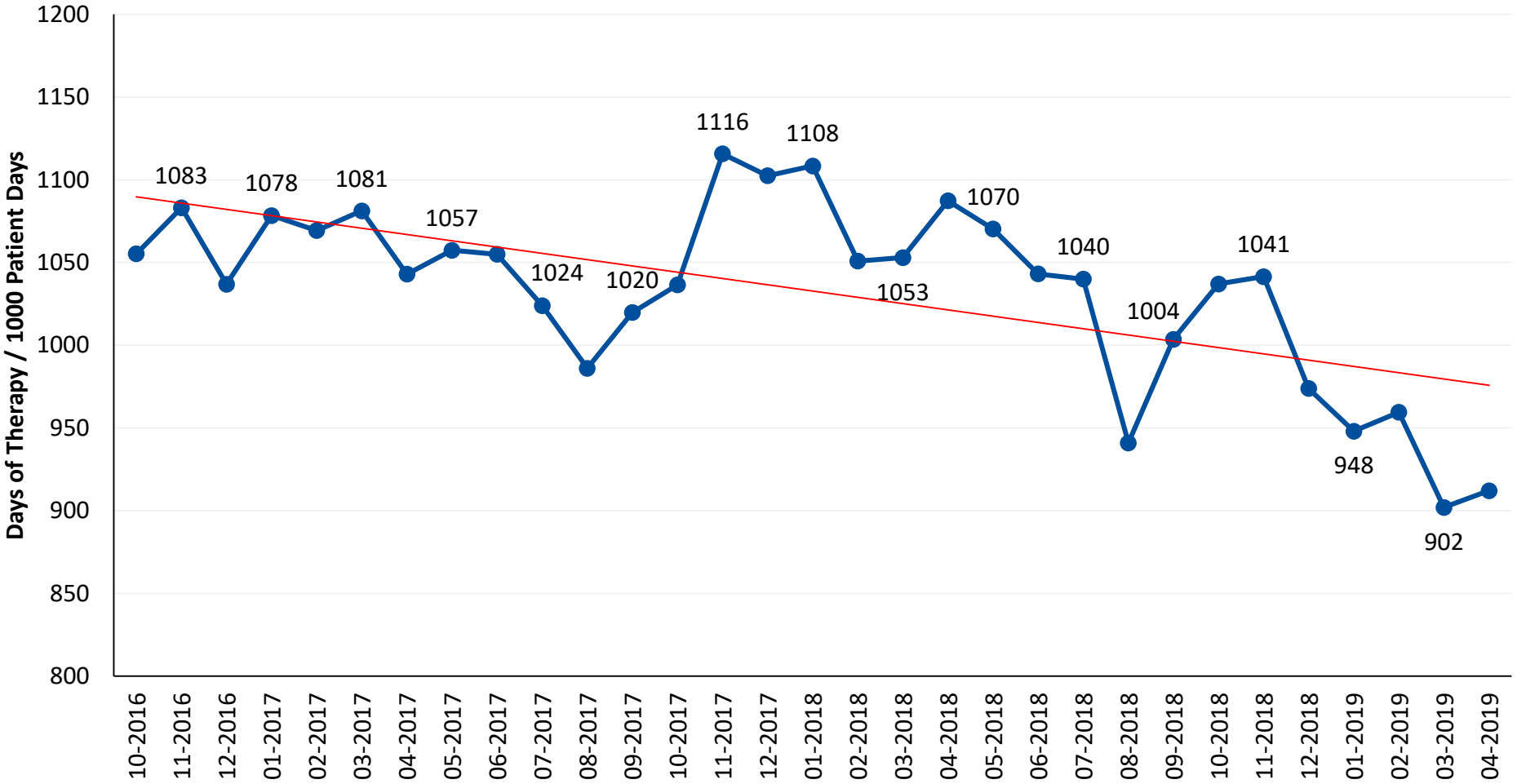
ASP Outcome Measures/ Reporting

Volume	Antimicrobial expenditure as percent of overall budget Days of therapy (DOT) / 1000 patient days

Anti-Infective Expenditure



Total Anti-Infective DOT



ASP Outcome Measures/ Reporting

Quality

Pharmacist interventions
Measure the appropriateness of antimicrobial use
Medication use evaluation (MUE) of targeted antibiotics

ASP Activities

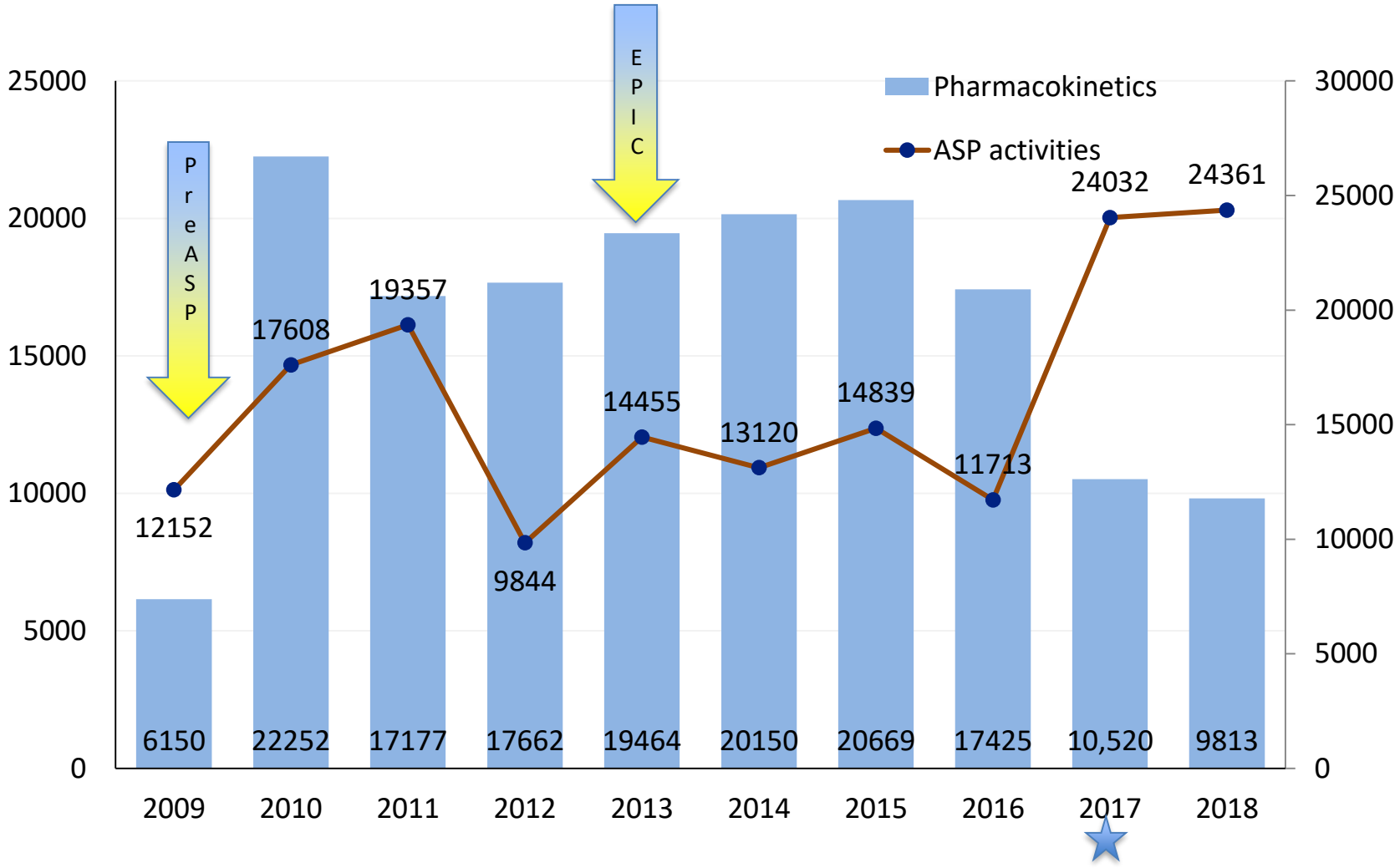
Monitoring activities

- All patients on PK dosing
- Antibiotic daily monitoring for indications
- Antiretroviral monitoring (HIV medications)
- *C. difficile* patients monitoring
- Criteria daily monitoring for appropriate indications
- Fluoroquinolone monitoring
- Dose assessment
- IV to PO evaluation
- Viral respiratory PCR cultures

Intervention sub-categories

1. **New pharmacokinetic consult**
2. **Pharmacokinetic consult follow-up**
3. **Formulary management**
4. **Allergy/ADR**
5. **Initial review antimicrobial**
6. **Follow-up review of antimicrobial**
7. **Modification of antimicrobial therapy**
8. **De-escalation of antimicrobial therapy**
9. **Escalation of antimicrobial therapy**
10. **Bug-drug mismatch**
11. **Order/monitor labs/levels**
12. **Drug interaction**
13. **Drug information**
14. **Dosing adjustment per organ function**
15. **Dosing adjustment per indication or weight**
16. **Duration of therapy**
17. **IV to PO conversion**
18. **Patient communication/education**
19. **C.*diff* monitoring**

Pharmacist Antimicrobial Interventions



Modified reporting criteria

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Medication Utilizations/ Guidelines Evaluations 2018

Initiatives	Drn	FH	GP	RYO	TAY	TRN	TROY	WYN
Ceftaroline	x						x	x
Daptomycin	x				x			x
Ertapenem	x				x	x	x	x
Meropenem	x							x
Linezolid	x				x			x
Avycaz/ Vabomere	x							x
Fidaxomicin	x						x	x
Pip/ Tazobactam	x					x		
Tigecycline	x							x
Erythromycin	x							
Rifaximin	x							
Fluoroquinolones and Clindamycin	x	x	x	x	x	x	x	x
Vancomycin		x						
Abx 48 hours time out				x				x
Respiratory viral panel / Abx de-escalation	x				x			
Procalcitonin protocol				x				
Febrile neutropenia	x							
Surgical prophylaxis post-Op duration	x			x		x		
Surgical prophylaxis choices				x		x		
COPD	x							
Hospital acquired C.diff and antibiotic use	x	x	x	x	x	x	x	x
Community acquired pneumonia (HMS)	x	x	x	x	x		x	
Asymptomatic bacteruria (HMS)	x	x	x	x	x		x	

ASP Outcome Measures/ Reporting

Outcome

Measure impact of antimicrobial stewardship
Annual antibiograms
Hospital-acquired *C. difficile* infection rates

Fluoroquinolone Interventions

A. October 2010
Established fluoroquinolone criteria for use and distributed guideline to physicians and pharmacists and posted on ASP intranet web page

B. November 2010-September 2018
Daily prospective audit and feedback of patients on fluoroquinolones

Antimicrobial stewardship competency for ongoing new-hire pharmacist training that includes fluoroquinolone education and orientation to stewardship resources

Performed annual medication use evaluations of fluoroquinolones to assess need for improvement and education

D. January 2018
Beginning of project to promote antimicrobial stewardship to frontline providers, specifically targeting internal medicine residents and faculty

Fluoroquinolone use data shared with ID physicians

E. February 2018
ED physician, nurse, and pharmacist education at staff meeting

F. April 2018
Nurse and nurse manager education at nursing leadership meeting

G. June-September 2018
Twice weekly meetings with internal medicine residents and faculty to review and provide feedback for patients on antibiotics (including fluoroquinolones)

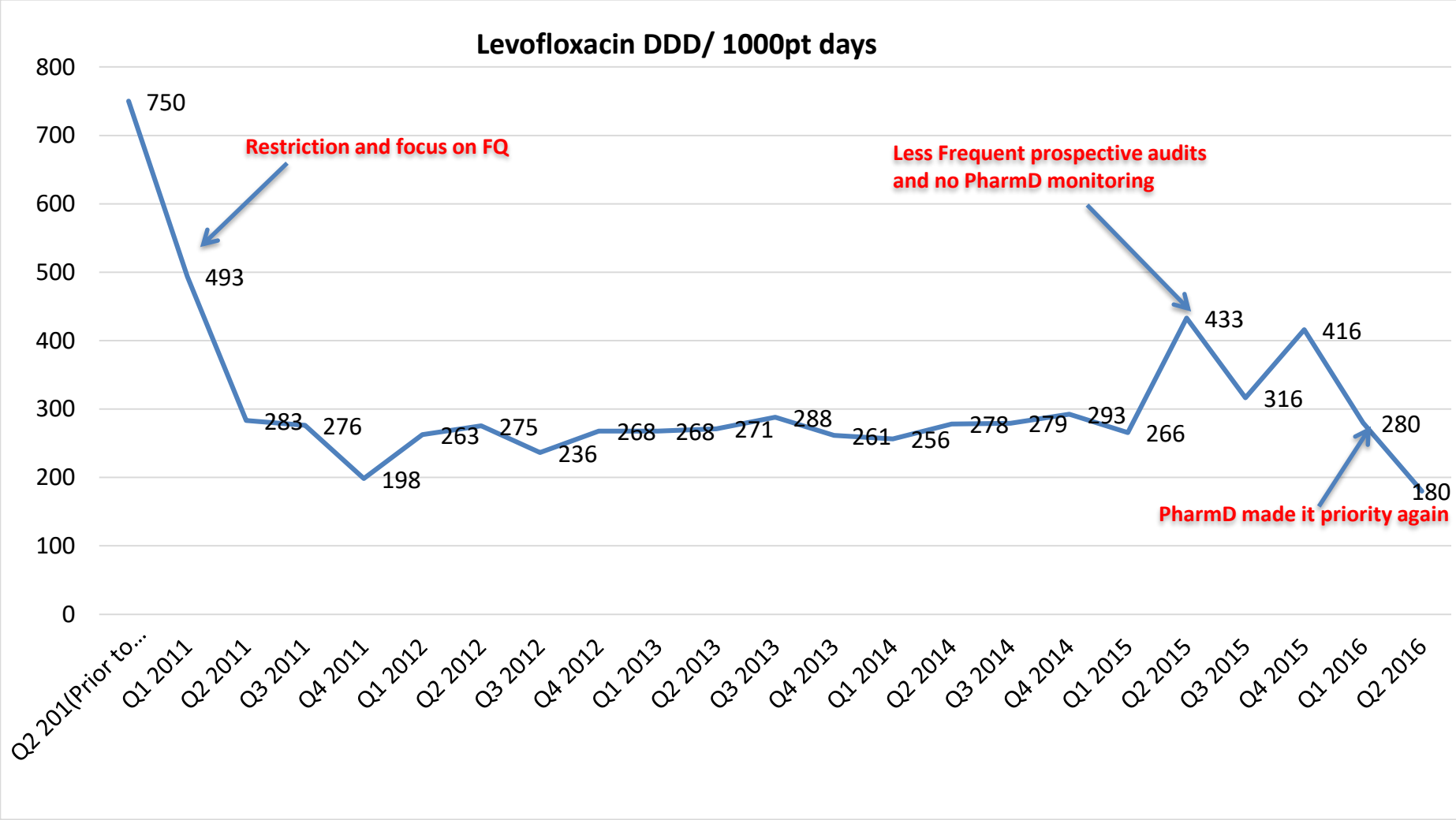
H. July 2018
Implementation of selective susceptibility reporting for pan-sensitive Enterobacteriaceae

Sent letter to all BH-D physicians highlighting criteria for use and adverse events associated with fluoroquinolones

Pharmacist education during professional development session

I. September 2018
ED physician, nurse, and pharmacist education at staff meeting

Impact of Fluoroquinolone Restriction on Levofloxacin DDD/ 1000 pt days



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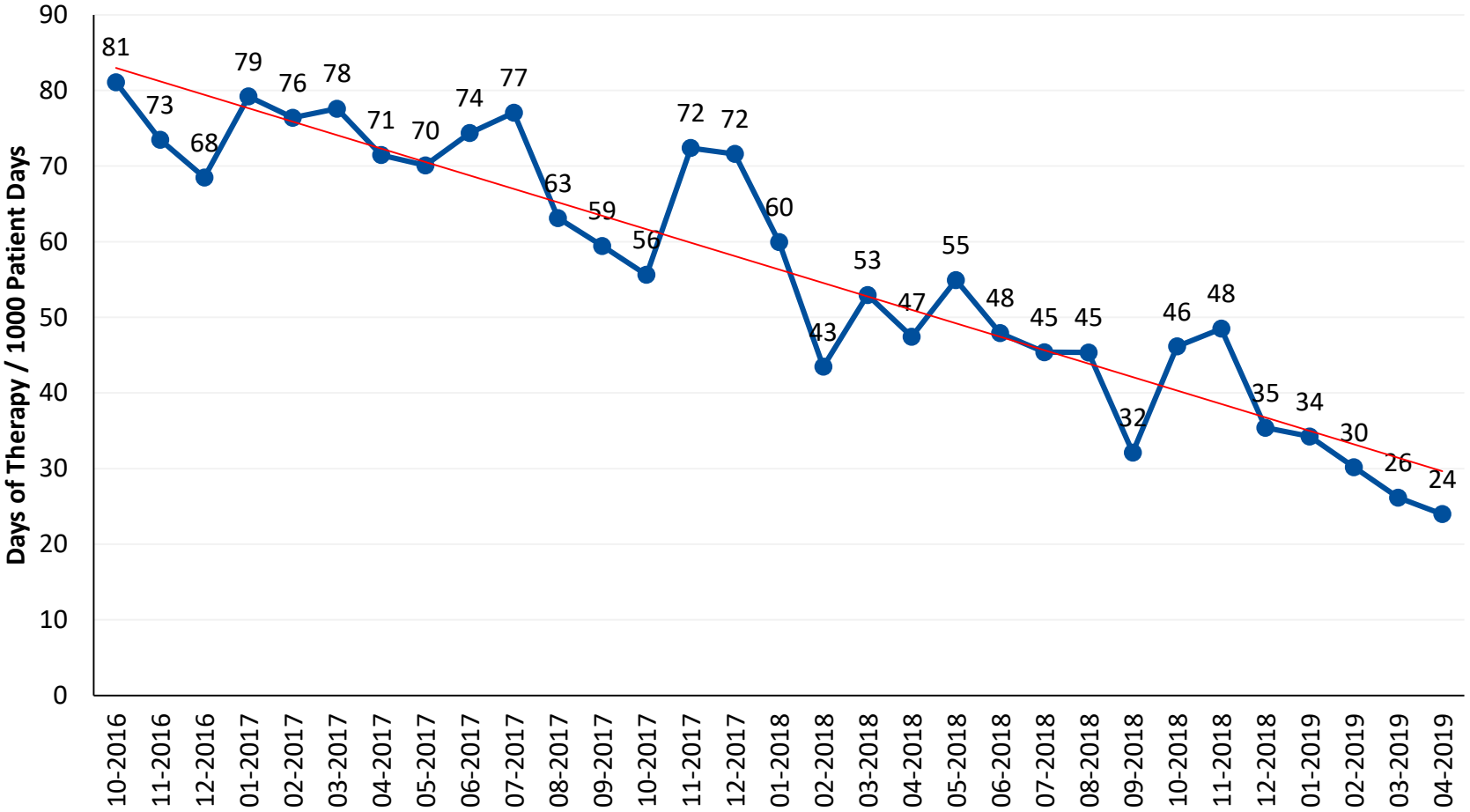
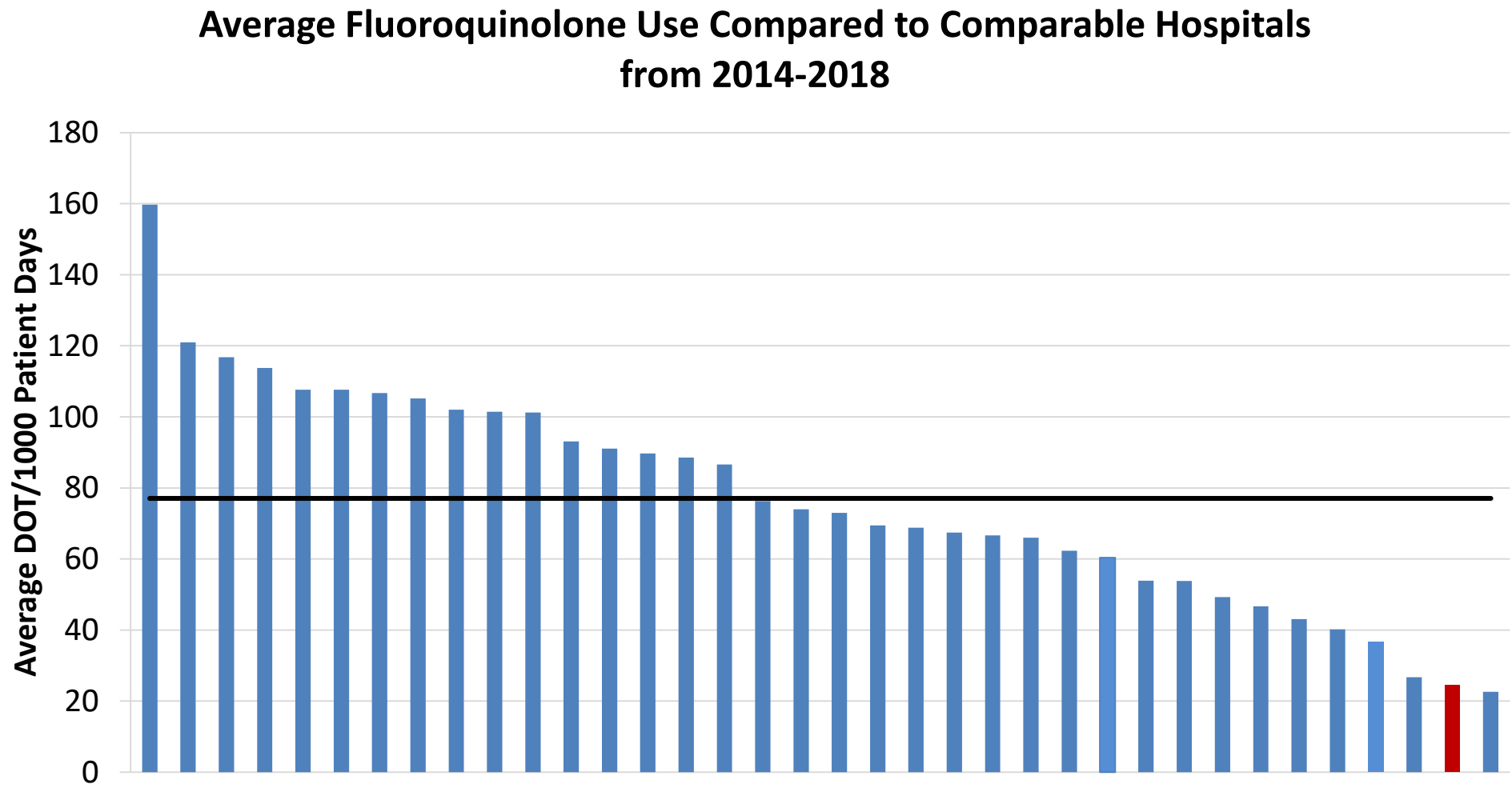
Impact of Fluoroquinolone Restriction on Levofloxacin DOT/ 1000 pt days



How does Fluoroquinolone Utilization Compare to National Average?



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2018 Interventions on Reducing:

Urinary Testing
Treatment of Asymptomatic Bacteruria
Duration of Antibiotics in CAP

Targets for Intervention

Emergency department

- Proactive and supportive chief
  - Engages multiple disciplines (e.g. physicians, mid-level providers, pharmacists)
  - Daily prospective audits of pneumonia patients
- Clinical pharmacy integration
  - 4 clinical pharmacist FTEs
- Regular standing agenda in monthly ED meetings
  - Retrospective review urine cultures from the ED to determine appropriateness of testing

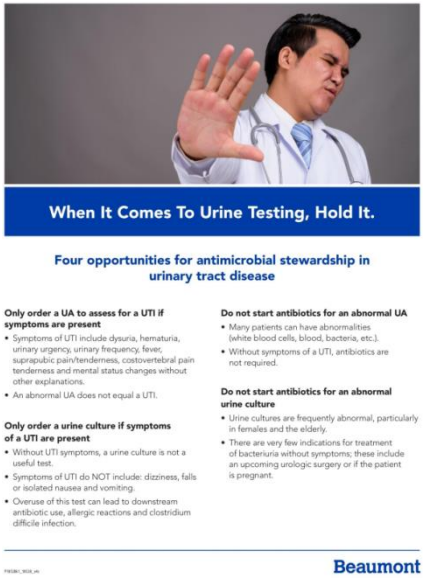
Internal medicine

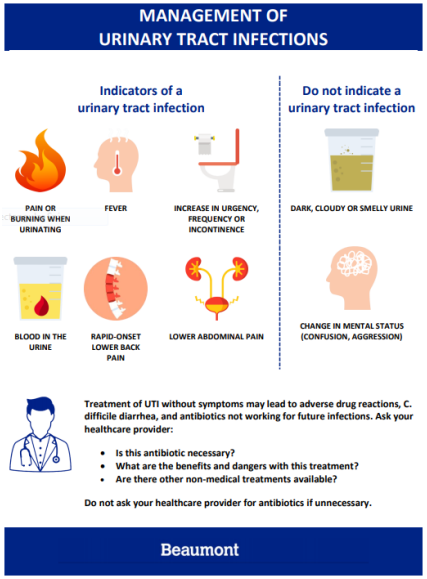
- Targeted Emergency, Internal Medicine, Family Medicine, Geriatrics, and Nursing with education
- Presented stewardship initiatives and materials at department meetings
  - Multiple mediums in multiple locations
    - Case-based reviews
    - Slide set presentations
    - Handouts
  - "Re-education without repetition"
- Materials distributed to physician's offices by physician liaison
- Root cause analysis letter addressed directly to providers about inappropriate cases

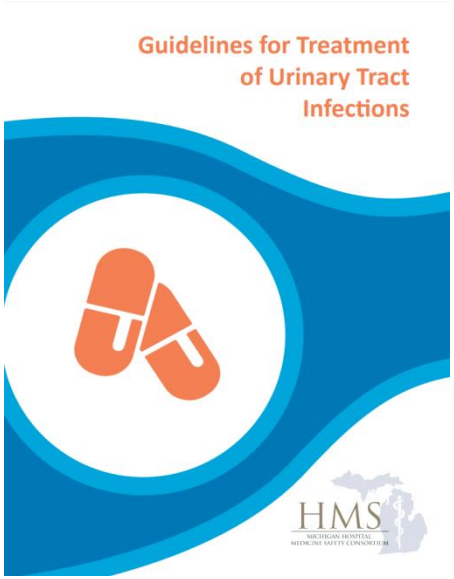
Information technology

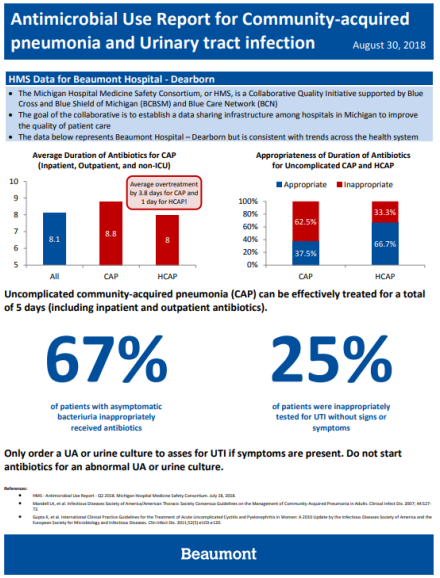
- Urinalysis criteria for use in EPIC
- Antibiotic total inpatient duration alert at time of antibiotic discharge –under build

Educational Materials/ Technology Upgrade

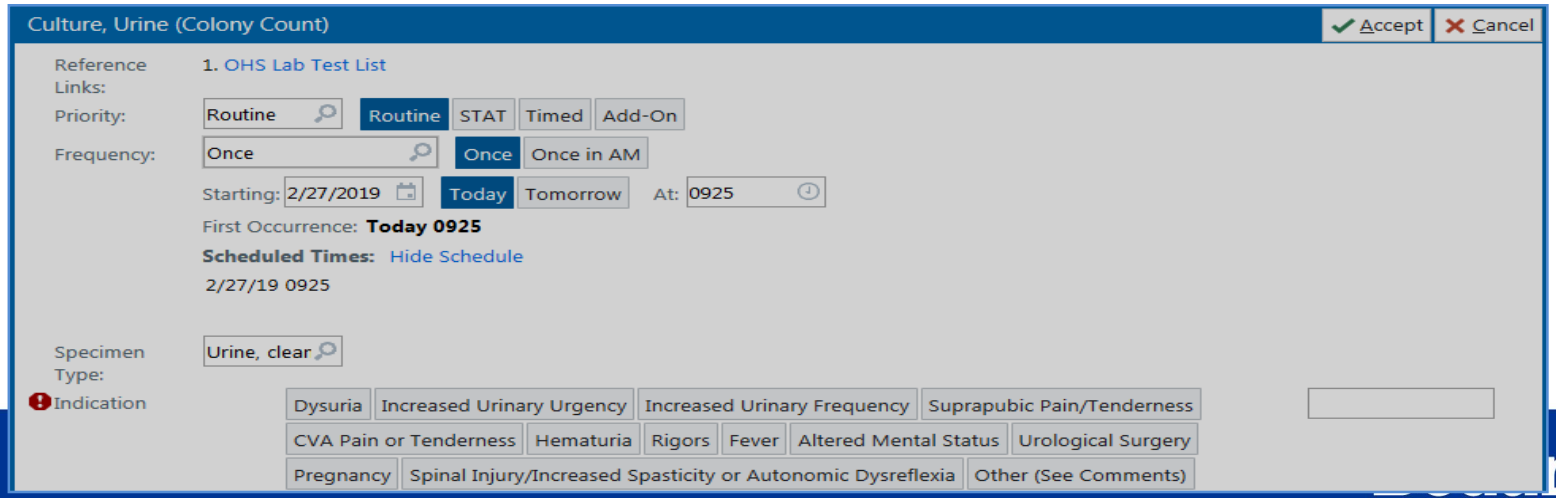




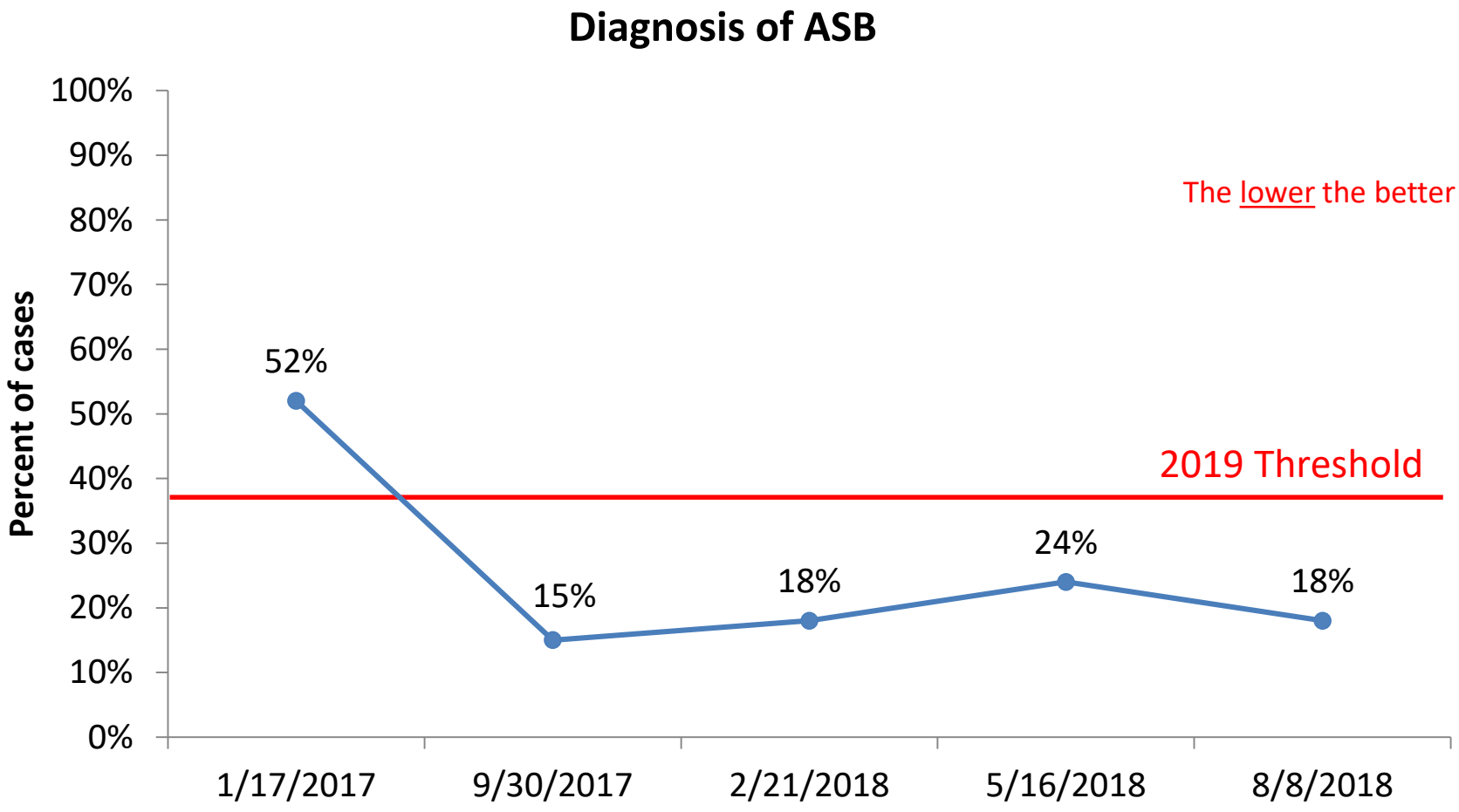




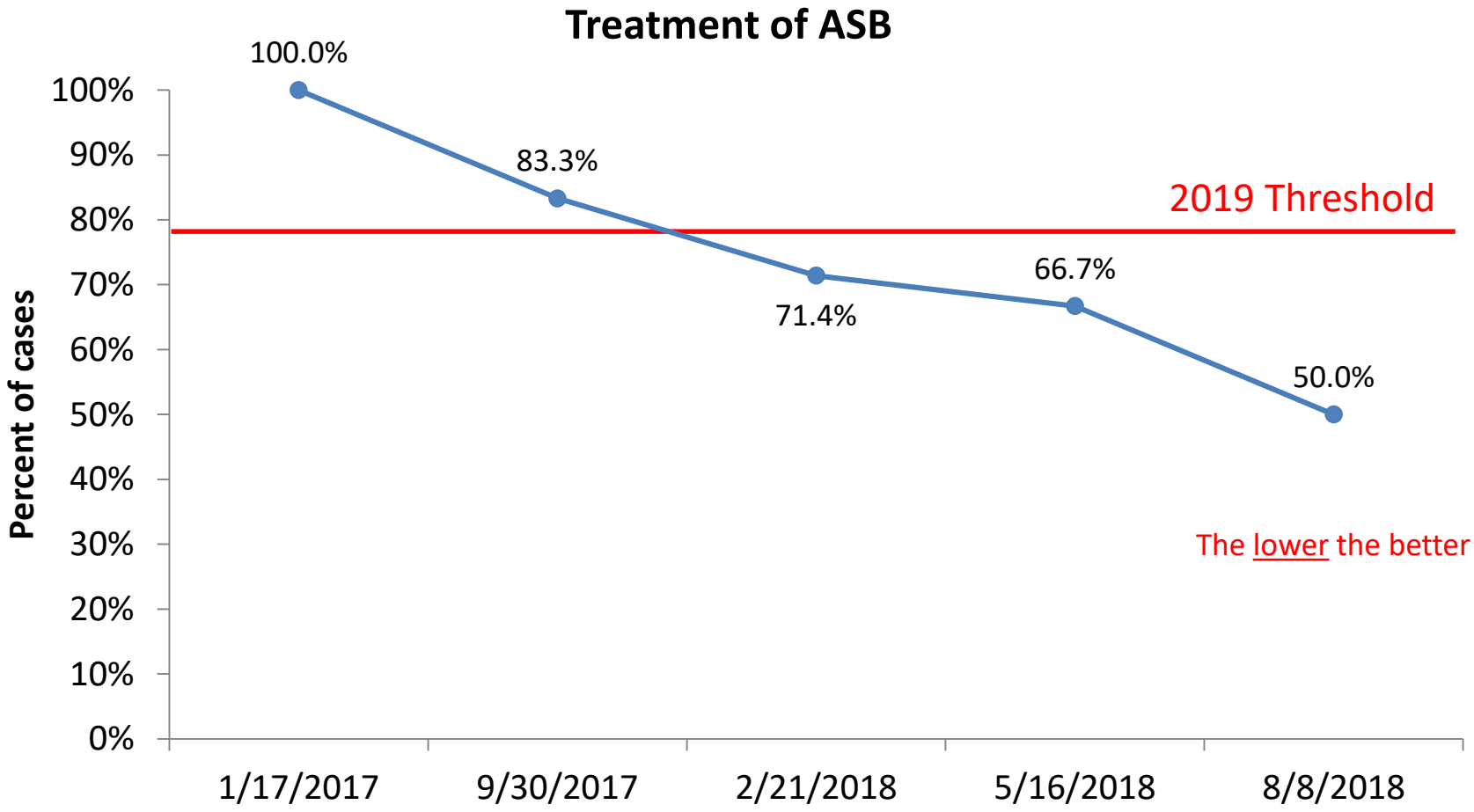
Providers **Patients** **Guidelines** **Data feedback**



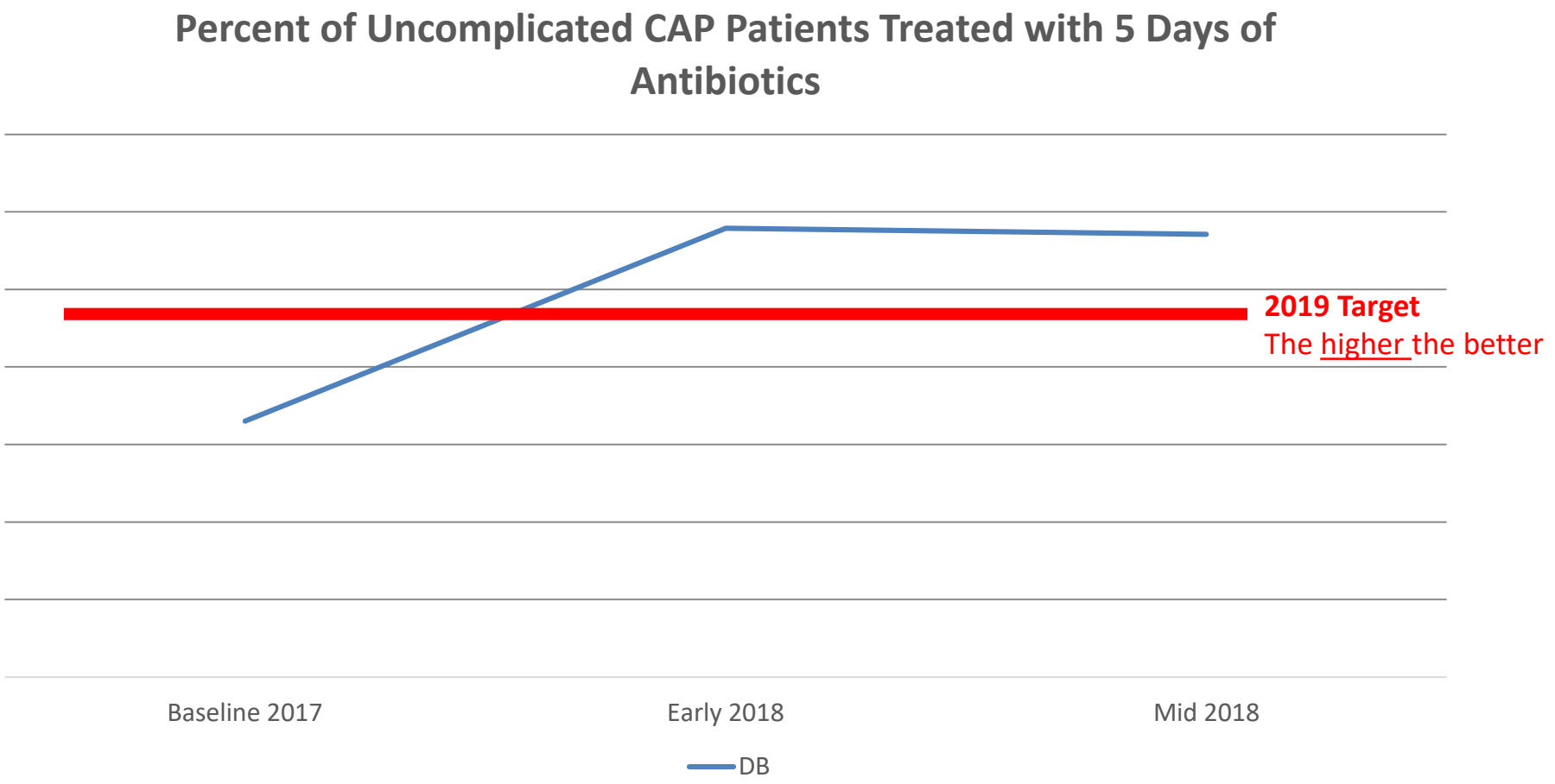
Impact of Education and Criteria on Asymptomatic Bacteruria Testing



Impact of Education and Criteria on Asymptomatic Bacteruria Treatment



Impact of Education and Auditing on Community Acquired Pneumonia



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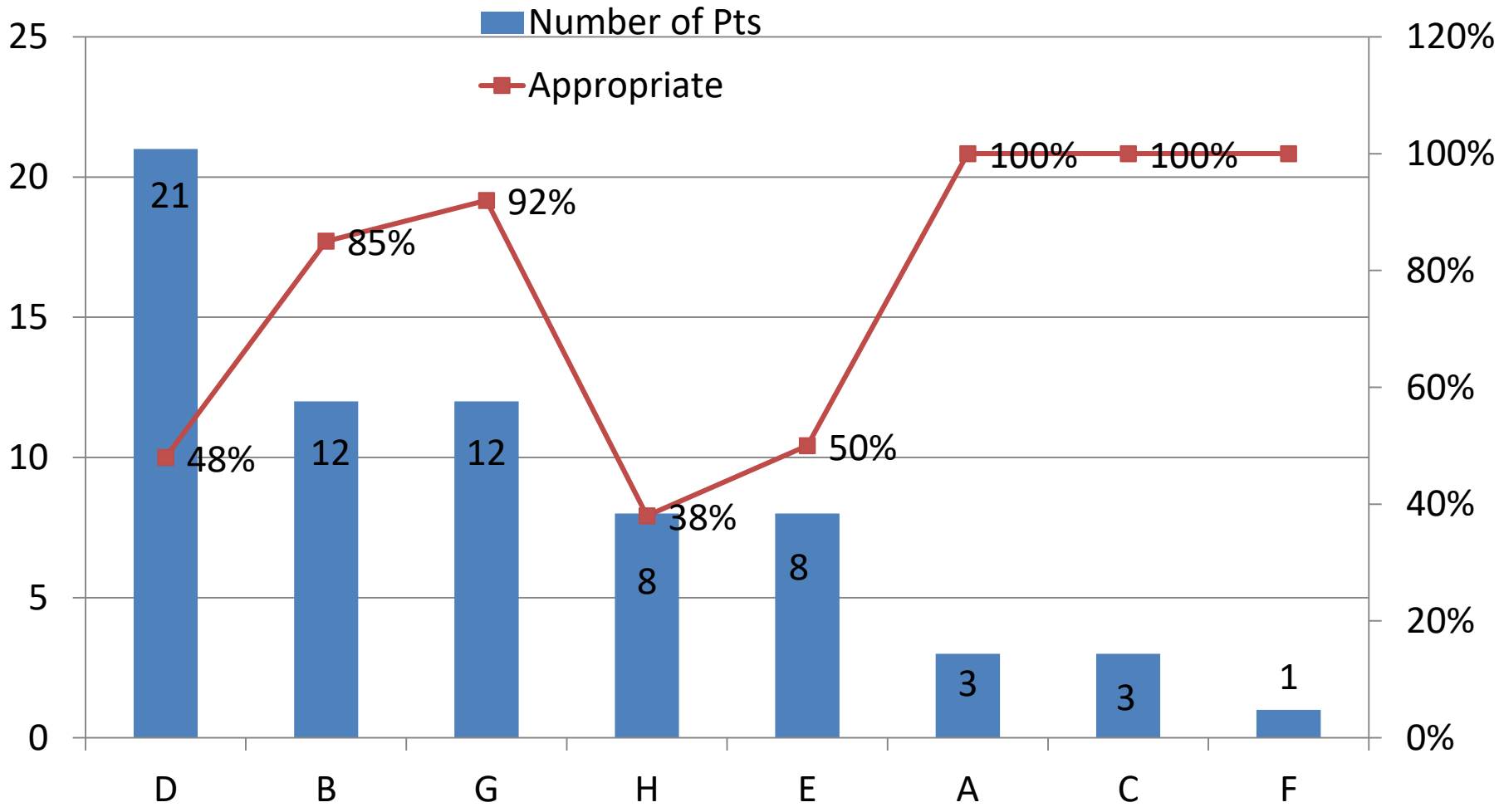
Report Cards to Prescribers



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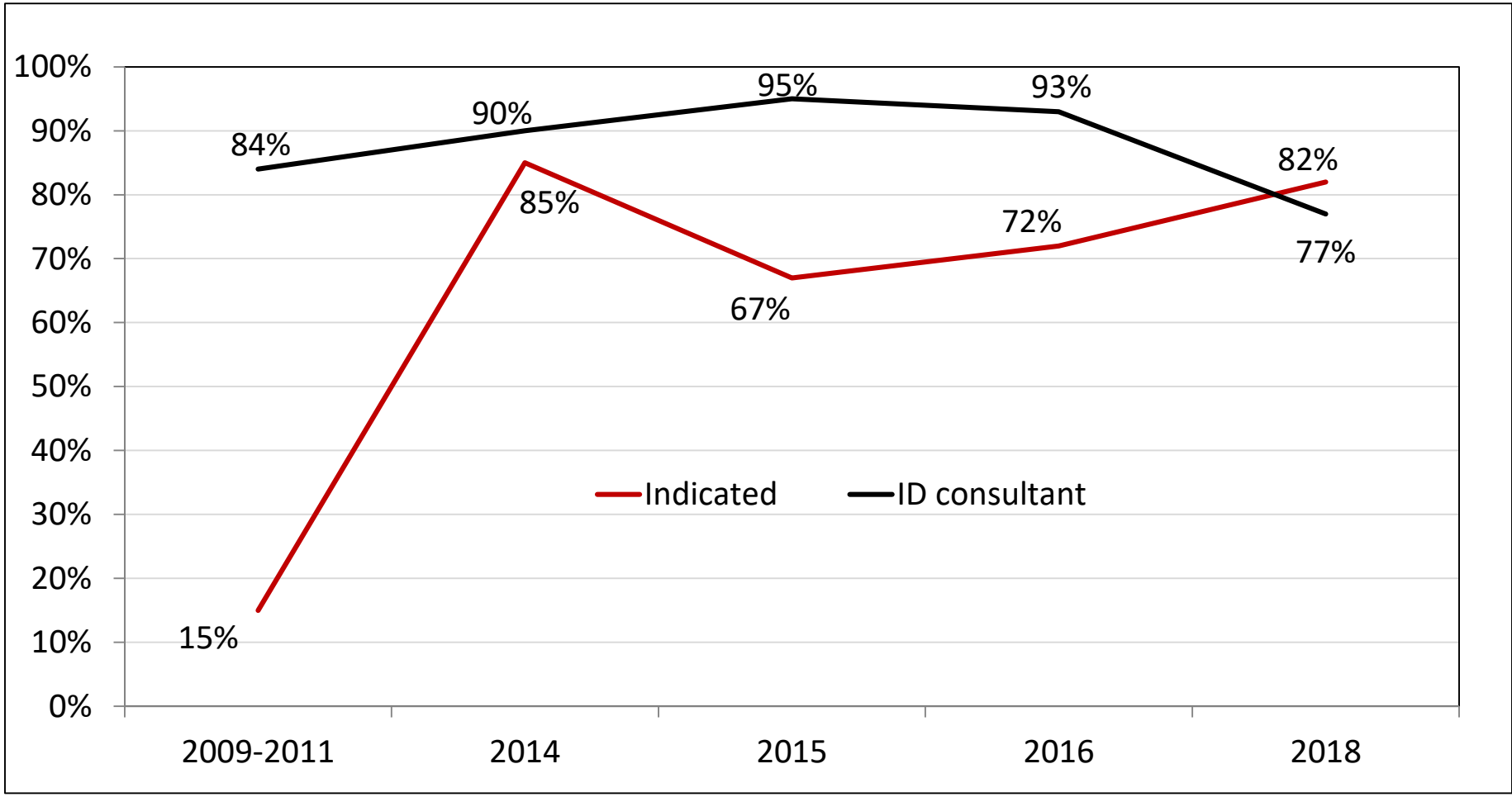
Impact of Report Cards on Daptomycin Indication For Use



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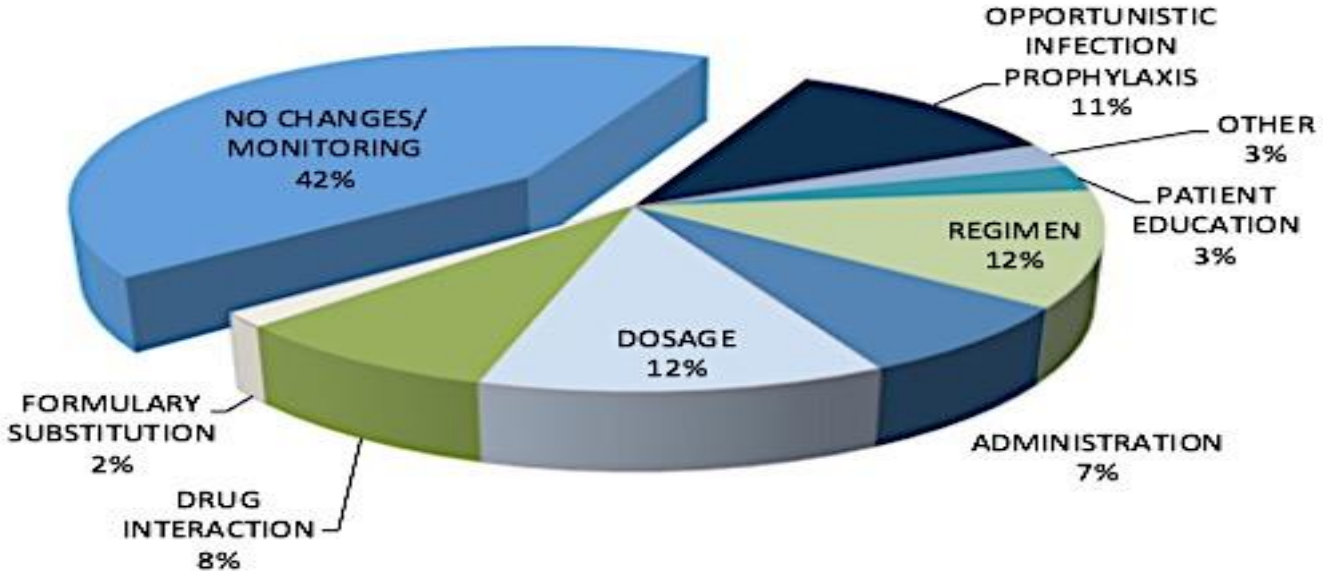
Antiretroviral Stewardship Impact

- Adult HIV positive patients admitted to hospital for any chief complaint/primary diagnosis
  - 1880 interventions recorded and met criteria
  - Sample analysis of 569 interventions



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Antibiogram

- Clinical microbiology laboratory has an integral role in promoting appropriate antimicrobial use
- Compiles antibiogram information at intervals (often annually)
- Makes decisions regarding implementation of rapid diagnostic tests
- Selective reporting of susceptibility results

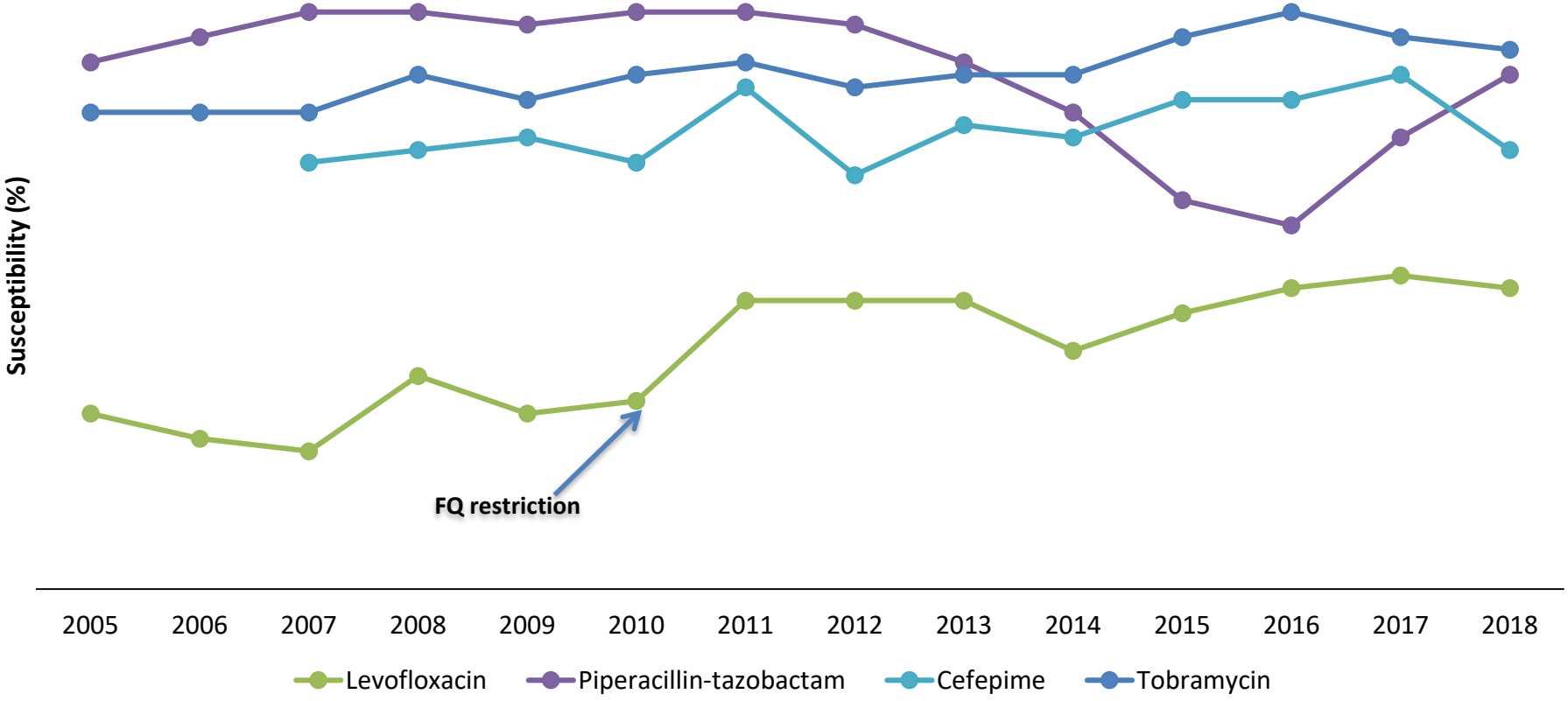
Antibiogram

- An antibiogram is a summary of antimicrobial susceptibility data for bacterial isolates recovered by a microbiology laboratory over a defined period of time
- Guide choice of empiric antimicrobial therapy
- Utilized by stewardship programs to develop facility-specific clinical protocols and monitor resistance trends
- Data are most useful when stratified by inpatient versus outpatient source
- Hospital site (eg, intensive care unit, general ward, emergency department)

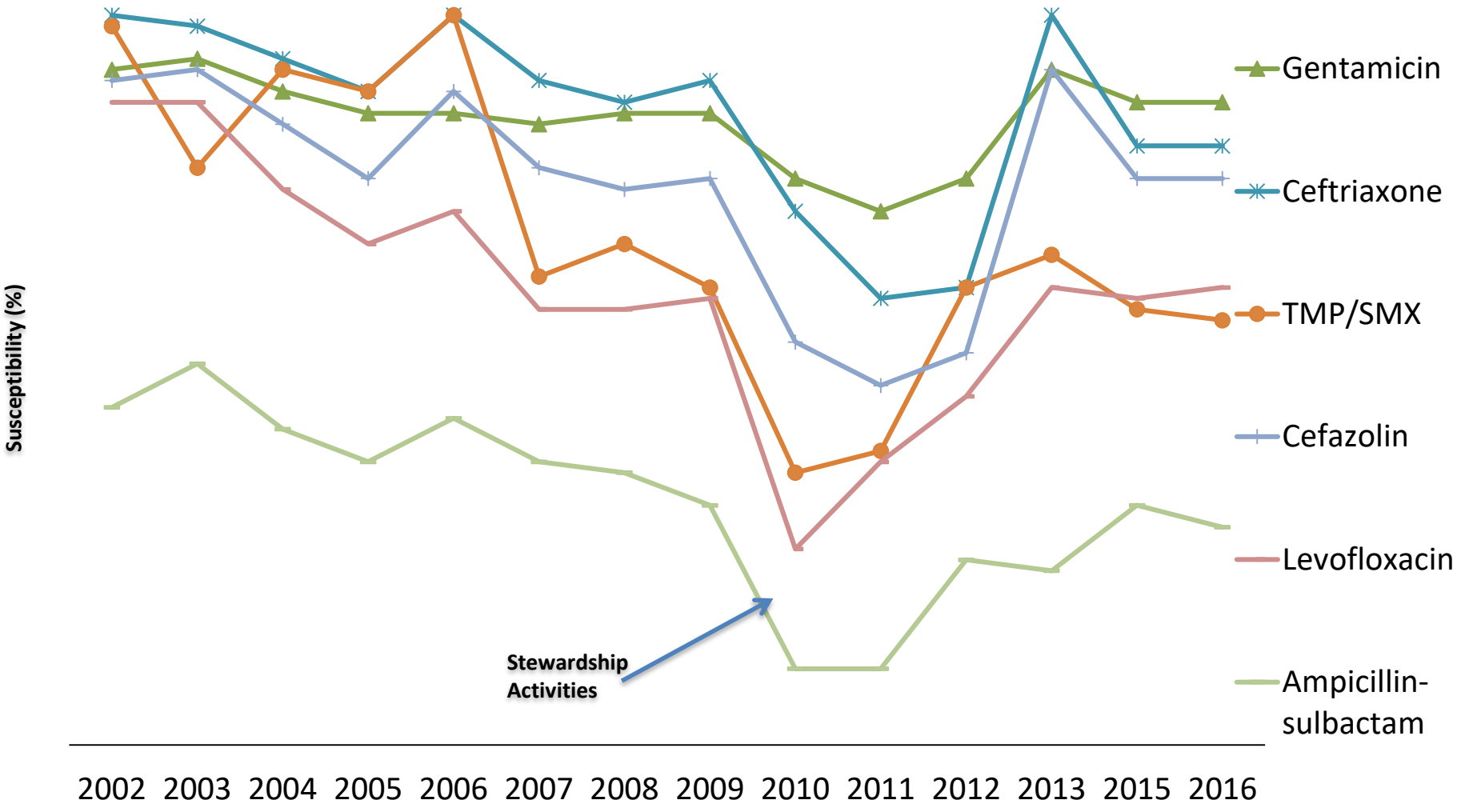
Antibiogram

- The Clinical and Laboratory Standards Institute guideline for Antibiograms
- Analyze and present a cumulative antibiogram report at least annually
- Include only final, verified test results
- Include data for species with ≥30 isolates
- Include only diagnostic (not surveillance) cultures
- Eliminate duplicates by including only the first isolate of a species/patient/analysis period, irrespective of site or antimicrobial susceptibility profile
- Include only antimicrobial agents routinely tested and calculate the percent susceptible from results reported
- Combination (contingent) antibiograms provide information about the likelihood that at least one drug in any combination of antimicrobials is active against a pathogen

Susceptibility Trends: Pseudomonas aeruginosa



Escherichia coli Susceptibilities



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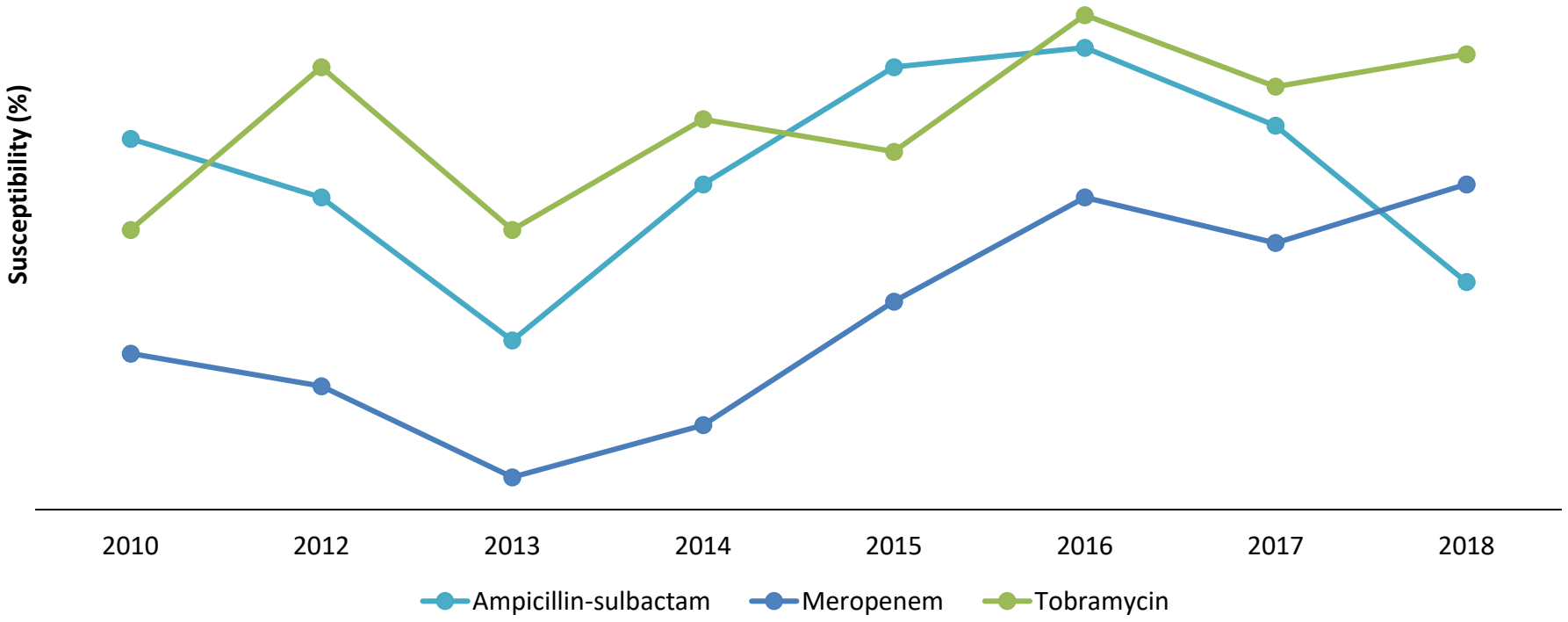
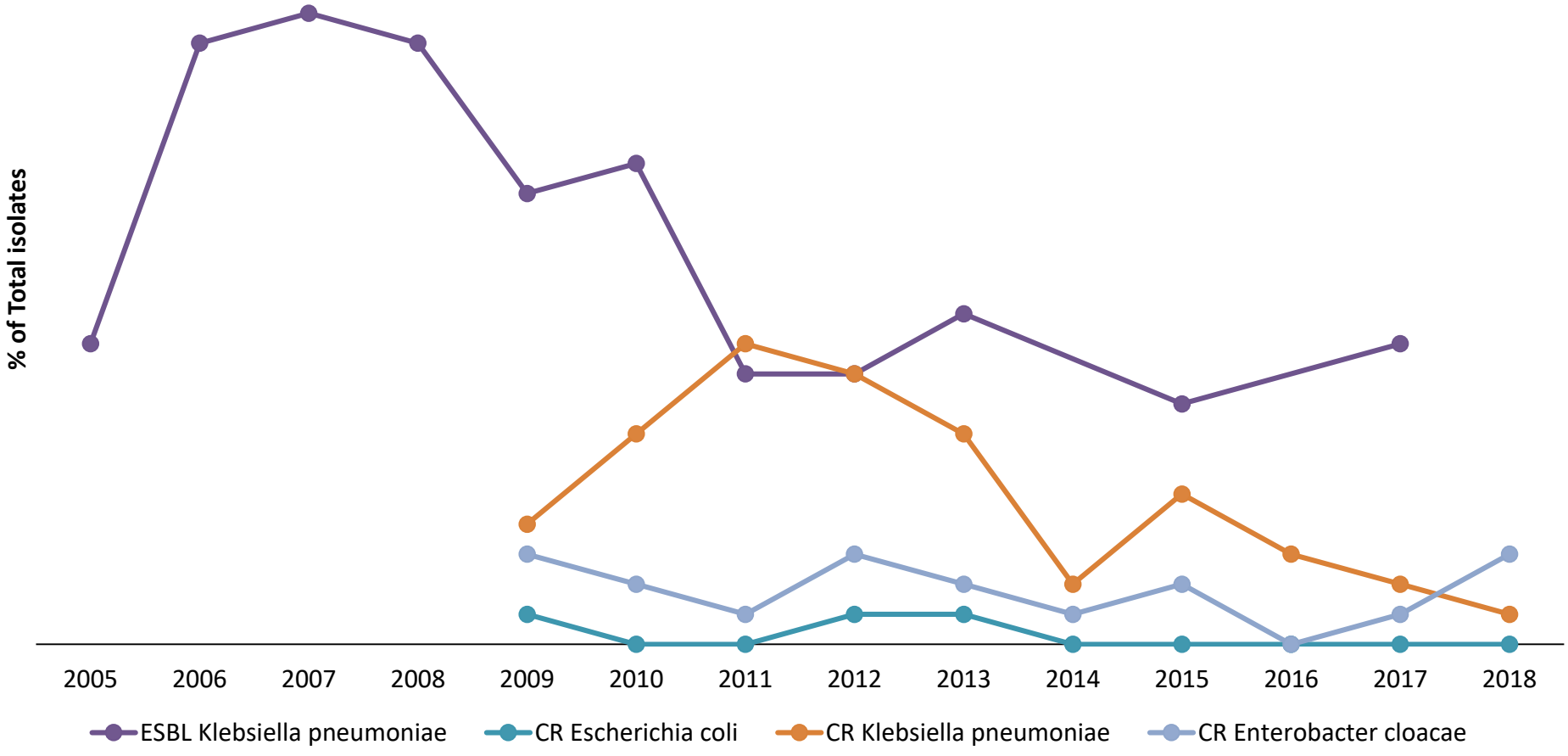
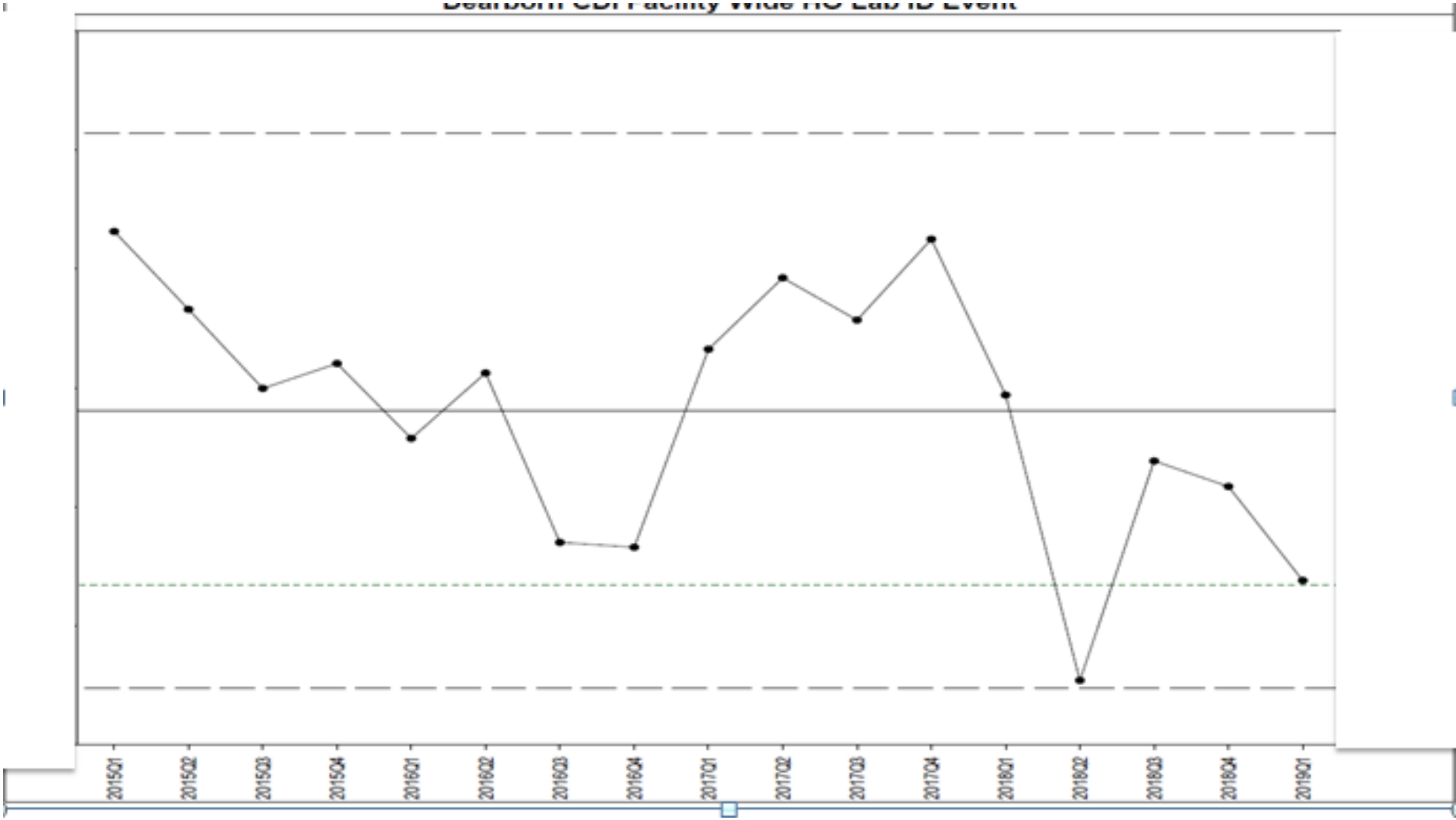
Susceptibility Trends: Acinetobacter baumannii



MDROs Rates


% of Total isolates
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
ESBL Klebsiella pneumoniae
CR Escherichia coli
CR Klebsiella pneumoniae
CR Enterobacter cloacae

C. difficile SIR



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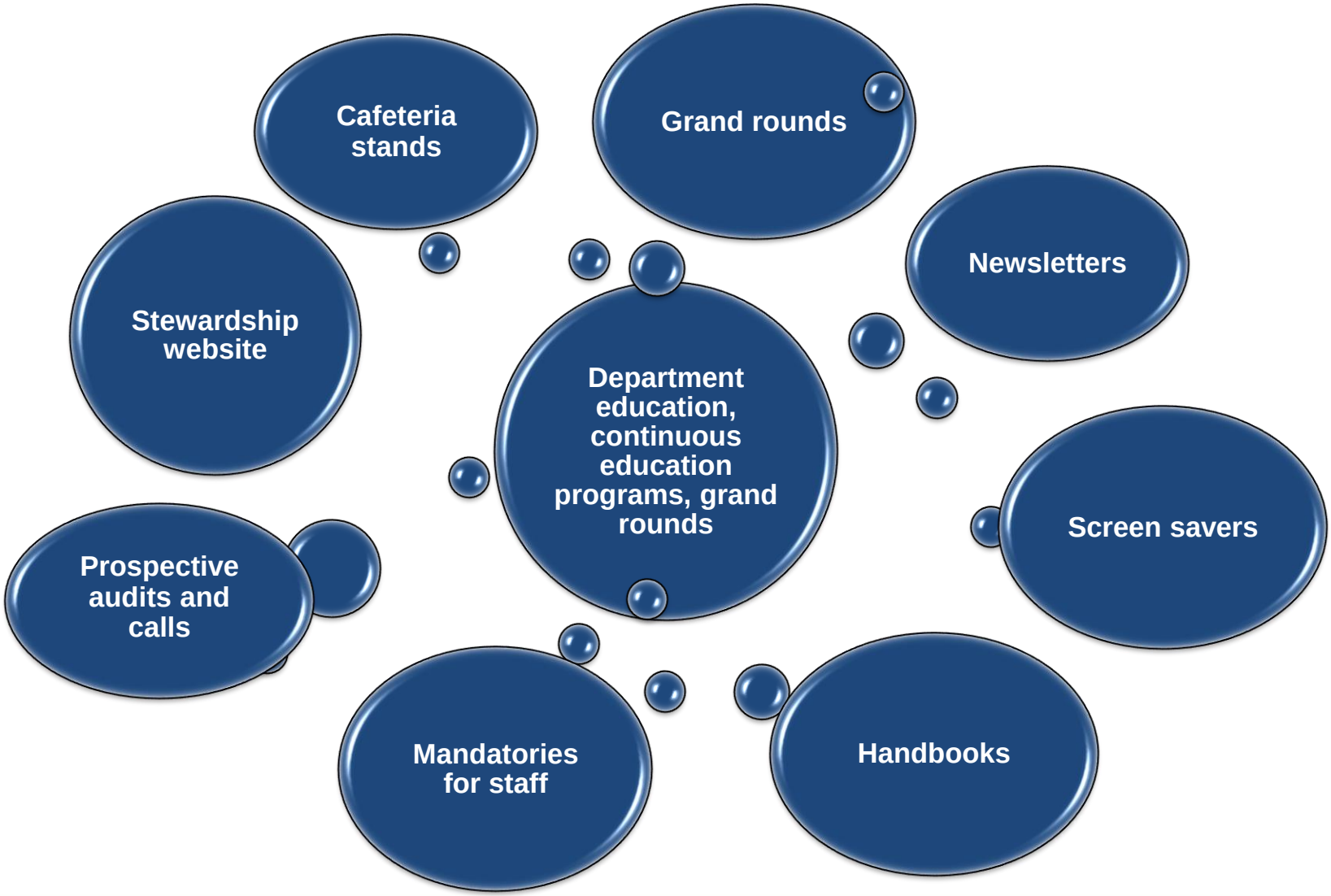
Staff and Patient Education



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Resources for Stewardship

http://www.qualityforum.org/Publications/2016/05/National_Quality_Partners_Playbook__Antibiotic_Stewardship_in_Acute_Care.aspx

https://www.cdc.gov/antibiotic-use/healthcare/programs.html

http://www.idsociety.org/PracticeGuidelines/

An interactive google decentralized model- Tool
https://docs.google.com/forms/d/e/1FAIpQLSfQw820V3U5GYWSnqIvaqKHbIRdB3OZWsw30jEc2ADG7Rg-mw/viewform

https://www.cdc.gov/longtermcare/pdfs/core-elements-antibiotic-stewardship-checklist.pdf

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Questions?